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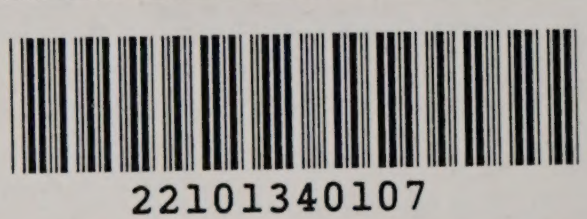
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A SYSTEM

OF

PRACTICAL THERAPEUTICS.

EDITED BY

HOBART AMORY HARE, M.D.,

PROFESSOR OF THERAPEUTICS AND MATERIA MEDICA IN THE JEFFERSON MEDICAL COLLEGE OF PHILADELPHIA.

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DISEASES OF THE STOMACH.

By THOMAS G. ASHTON, M. D.

ACUTE GASTRITIS OR ACUTE GASTRIC CATARRH.

To this most common of gastric disorders many individuals seem to have a special predisposition, which in some appears to be decidedly hereditary. Such individuals, possessing a "weak stomach" as it has been termed, cannot partake of the quality or quantity of food ordinarily digested without difficulty by the normal stomach, without being subjected to an attack of acute gastritis. These cases are frequently those that give no history of dietetic abuse to which the enfeebled digestion can be ascribed, and yet they have always been liable to attacks of the disorder. In fact, in many of them the history of heredity is evident from the statement by the patient that a parent or several members of his immediate family suffer in the same way.

Acute gastritis is usually to be ascribed to errors in the diet both as regards the quantity as well as the quality of food ingested. If more food be taken than the stomach can digest, irritation of the mucosa results, followed finally by the changes incident to an acute inflammation. In this sense, that is as a local irritation, every case of acute gastritis is, as pointed out by Ewald, in reality a toxic gastritis. The same may be said of those cases of the disease arising after the ingestion of food of improper quality which, during its retention in the stomach, undergoes decomposition and fermentation, the products of which act probably as a local irritant and excite an acute gastric catarrh. These foods may have already undergone decomposition or fermentation at the time of ingestion, and particularly is this true of butter, of eggs, and of articles of diet prepared from eggs; it is also true of the milk and milk-foods partaken of by children, which so readily undergo fermentation during the warm seasons of the year. The fermentation of food after it has reached the stomach seems to depend upon the absence of hydrochloric acid, as in every case of acute gastritis this constituent of the gastric juice is wanting. Just exactly what the product of decomposition is that produces the irritation of the stomach resulting in acute gastritis does not seem to be

definitely determined. That it is not due to lactic acid Ewald [1] concludes from the fact that this substance is normally present, for instance at the beginning of the digestion of food, and that the medicinal administration of lactic acid, as well as its ingestion in such substances as kefir and koumyss, is unattended by any harmful results to the stomach.

As to whether acute gastritis occurs as the result of infection is still a question that requires to be definitely settled. It is extremely doubtful that such an affection prevails as the result of a direct invasion of the stomach-walls by micro-organisms, with constitutional infection. Inasmuch as this form of gastric infection has not been demonstrated, the contention of Lebert that a special infectious form of the disease occurs is not proven, although the occurrence of acute gastritis apparently in epidemics would tend to confirm his view. This latter circumstance, however, is susceptible of the explanation that the greater number, at least, of those cases of so-called infectious gastric fever are in reality instances of the mild forms of enteric fever. Acute gastritis usually accompanies most of the acute infectious diseases, especially at their onset.

Treatment.

A knowledge of the etiology of acute gastritis will aid us materially in instituting an efficient therapeusis. It teaches us that the affection is not of spontaneous occurrence, and that it is always induced by the direct introduction into the stomach of some irritating substance. Of course, the indication is the removal of the source of irritation.

In mild cases the stomach cares for itself, and by spontaneous emesis gets rid of a large quantity of the irritating substances, while the remainder, passing into the intestines, finds evacuation in the diarrhœa which its presence there excites. Under ordinary circumstances, therefore, the patient recovers without the use of drugs, except possibly a mild purgative, and abstinence from food. In most cases fasting is self-regulative, as the complete anorexia accompanying the affection prevents the patient from taking food for twenty-four hours or more. Thus the stomach not only obtains needed rest, but further irritation is avoided.

In severe forms of acute gastritis, requiring the interference of the physician, the treatment should be carried on in such a way that the spontaneous efforts of the stomach and intestines at relief may be aided. When vomiting has not spontaneously occurred, and epigastric distress and fulness indicate that the stomach is full, we must take measures to empty the stomach, especially when the eructation of

[1] *Klinik der Verdauungskrankh.*, Bd. ii. S. 162.

foul-smelling gases associated with pyrosis indicates that the retained gastric contents have become decomposed. While this may best be brought about by the use of the stomach-tube, it is more feasible, perhaps, to first employ other means, as to most of these patients it would imply the introduction of the tube for the first time, and therefore in many of them would excite alarm and constitute an augmentation of their distress. One of the simplest means of emptying the stomach under these circumstances, and one which the people have learned to practise for themselves, is to direct the patient to drink a pint or more of tepid water in which a small quantity of common salt has been placed. The finger may then be carried as far as possible down the throat in order to produce vomiting. In many cases this is unnecessary, as to a good many people the tepid water is in itself sufficiently nauseating to produce emesis.

Should these means prove insufficient the use of emetics may be resorted to, although their use is inadvisable on account of their local irritant effects and the additional distress they cause the patient. As possessing the least of these disadvantages apomorphine, administered hypodermically in doses of $\frac{1}{10}$ of a grain, should be used. In children emetic doses of ipecacuanha or of tartar emetic may be used, but the employment of these drugs is not advised in adults. Should constipation exist and continue for several days, resort must be had to the use of some mild purgative; otherwise no medicine is required in the majority of cases. For this purpose probably the best results are obtained from calomel given in a single large dose of 10 grains, to an adult. Should there be delay in its action it may be followed by one of the mild saline aperients, these remedies in themselves being of very great service. If the effects of calomel be not desired, therefore, we may order Seidlitz powders, a glass of Hunyadi water, or citrate of magnesia, the contents of the bottle as ordinarily purchased being divided into equal doses, the second dose being taken about four hours after the first, should further action be desired. I am in the habit of employing smaller doses of this remedy with greater frequency of administration, and under these circumstances order a tablespoonful or two tablespoonfuls, to be given every hour until the desired effect is obtained. Bicarbonate of soda, subnitrate of bismuth, or other alkalies and antacids may be given if marked pyrosis exist and if the patient be greatly troubled thereby.

For the first day or two the stomach should be allowed almost complete rest from food. Indeed, the extreme anorexia from which the patient suffers practically secures this rest for the stomach, and it is a good plan not to force food upon the patient until he begins to experience a craving for it. For the first twenty-four hours after the stomach has been emptied, therefore, no food should be administered,

the continued irritability of the organ and the thirst from which these patients usually suffer being relieved by the swallowing of small pieces of ice or of small quantities of carbonated water. During the second day food of the lightest possible character may be given, such as milk and lime-water, or a combination of equal parts of milk and Vichy water, some one of the clear broths or soups, strained oatmeal, milk-toast, and the like. As the case progresses we pass to more substantial articles of diet, such as rice, oatmeal-gruel, a soft-boiled egg, buttered toast, and oysters; and later on, as improvement continues, scraped beef, a small chop or small piece of broiled steak may precede the gradual return to the ordinary dietary.

TOXIC GASTRITIS.

This term is usually restricted to those cases of gastritis that arise from the swallowing of substances that directly affect the gastric mucosa, producing either an inflammation of an intense degree, or, as is the case in many of them, causing a more or less extensive destruction of its tissue. Among the substances having this effect when swallowed may be mentioned the mineral acids in a concentrated form, the caustic alkalies, the metals and metallic salts, such as arsenic, phosphorus, corrosive sublimate, potassium chlorate, and other substances such as alcohol, nitro-benzol, and carbolic acid.

The damage done the stomach by the ingestion of any one of these substances depends upon the exact nature of the poison and the amount that has been taken, as well as upon the condition of the stomach at the time, whether full or empty. In the case of the corrosive poisons not only may the mucous coat be involved, but the underlying tissues down to the serous covering may be entirely destroyed and converted into a charred and blackened slough; in this event perforation of the serous coat occurs, and the contents of the stomach find their way into the peritoneal cavity. Alcohol and phosphorus, and drugs acting in a similar manner, produce a very intense form of inflammation, with much swelling of the mucous membrane, accompanied by superficial necrosis and minute blood-extravasations; and by a microscopical examination the glandular structure is observed to have undergone a mucoid and fatty degeneration.

Treatment.

The treatment of toxic gastritis consists theoretically in the prompt evacuation of the stomach-contents; or, failing in that, as in the case of the corrosive poisons, their neutralization and dilution. In all cases of acute poisoning not due to corrosive substances, the stomach should at once be emptied with the stomach-tube in order that that

portion of the poison not as yet having entered the small intestine may be removed, and the further general intoxication of the patient prevented. The use of lavage in these cases is much to be preferred to the administration of an emetic, as the stomach can in this way be more thoroughly cleansed. Lavage is inadmissible in all cases of corrosive poisoning when danger of perforation exists, and if the nature of the poison swallowed be in doubt, inspection of the mouth and pharynx will usually reveal whether or not it be due to any caustic substance. Under these circumstances, therefore, we must rely upon our efforts to effect the neutralization of the unabsorbed portion of the poison that remains within the stomach. In the event of poisoning by an acid this may be accomplished by means of calcined magnesia given in the proportion of about 3 ounces of the magnesia to a pint of water or milk; in the case of the mineral acids a harmless compound is thus formed. If the poisonous substance ingested has been an alkali its neutralization must be brought about by the drinking of lemonade, vinegar, or a weak solution of tartaric or acetic acid. Within the limits of the present article it is impossible to mention all the antidotes of the various poisons, and only these very general lines of treatment can be laid down.

The individual symptoms are to be treated upon general principles. To overcome the condition of profound collapse into which many of these cases rapidly pass it is necessary to surround the patient with artificial heat and to freely stimulate. This latter procedure is rendered impossible by way of the stomach on account of the intense inflammation of the organ and the persistent vomiting usually accompanying the affection. It becomes necessary, therefore, to depend largely upon the hypodermic administration of stimulants, and in this way we may employ strichnine, digitalis, or the more readily diffusible stimulants, such as whiskey, brandy, aromatic spirits of ammonia, and ether. Stimulants may also be given by way of the rectum, and in some cases much advantage is obtained by the rectal administration of black coffee given hot, which not only stimulates directly but also tends to overcome the patient's subnormal temperature. The urgency of the vomiting may be assuaged by the swallowing of small pieces of ice or small quantities of some aërated water or a dry champagne, and for the relief of this symptom good results are sometimes obtained by the frequent administration of small doses of cocaine. The pain attending a severe case of toxic gastritis is usually agonizing and calls for the free administration of opium or one of its derivatives. Unfortunately in many of these cases treatment is simply palliative, and our services to the patient are limited to keeping him as comfortable as possible until death relieves his suffering.

PHLEGMONOUS GASTRITIS.

PURULENT gastritis or suppurative inflammation of the stomach is an extremely rare form of inflammation of the stomach; it is more common among men than women and is most frequently met with between the twentieth and sixtieth years. It differs from simple acute gastritis in that the lesion does not exist in the glandular layer of the stomach but in the submucous and muscular structures, in which numerous small abscesses are usually found. The mucous membrane covering the areas of lesion is greatly swollen and infiltrated, and in advanced cases, through implication of the serous coat, perforation occurs into the peritoneum or, by sloughing of the mucous membrane, into the stomach. In size these abscesses vary within wide limits. The disease exists in two forms, the idiopathic or primary and the metastatic. The exact cause of the former is as yet unknown, but it is probable that it is due to a direct infection of the stomach by some pus-producing form of organism. The metastatic variety occurs as a part of a general pyæmia, or accompanies puerperal fever or at times the exanthematous diseases.

Inasmuch as the diagnosis of the affection is rarely possible during life, the outline of treatment can only be symptomatic.

CHRONIC GASTRITIS, CHRONIC GASTRIC CATARRH, CHRONIC GLANDULAR GASTRITIS.

THERE appears to exist in the minds of many such an imperfect conception of what the term "chronic gastric catarrh" or "chronic dyspepsia" actually implies that a short description of the usually accepted varieties of the condition and the pathological changes taking place seem to be called for. This confusion seems the more remarkable as chronic gastric catarrh is one of the most frequently-met-with disorders and preponderates in all of our large dispensaries. It can be explained only by the fact that much carelessness still exists in the diagnosis of diseases of the stomach, and that the lessons imparted by modern methods of investigation go unheeded. It should first be understood that the term "dyspepsia" should be employed only in a symptomatic sense, leaving the underlying cause still to be looked for. For so long a time has this term been used synonymously with the affection about to be discussed, that it is of the utmost importance that we understand the true cause and the symptoms of the disease, for without this correct treatment is impossible.

The limitations of the present article render impossible an extensive discussion of the pathological changes characteristic of chronic

gastritis, nor does such a discussion seem necessary. It is important to make clear, however, that the affection is characterized by inflammatory processes the initial changes of which may be either an interstitial increase resulting in atrophy of the secretory cells due to the cutting off of their nutrition, or else the glandular structure may be primarily involved with the result that parenchymatous degeneration occurs. In either anatomical form, however, the tendency is to ultimate and complete atrophy of the secreting structure. With the knowledge of these changes it becomes clear that they must give rise to an alteration of the gastric secretions, and inasmuch as the process is an inflammatory one the secretions from the characteristic glandular structure must be diminished; therefore we must look for a diminution of hydrochloric acid and pepsin. This statement does not apply, however, to the secretion from the mucous glands, so that even in those cases in which hydrochloric acid is entirely absent the gastric mucus is often present in excess.

It seems to me that it is still advisable to adhere to Ewald's classification of the disease into three varieties, made in accordance with the character of the gastric contents, so that attention may at least be called to the fact that these contents are not the same in all cases. The affection as thus classified is divided into simple gastritis; mucous gastritis; and atrophic gastritis.[1]

In the first variety the fasting stomach contains a small quantity of mucoid material, thin and watery in consistence, which is not infrequently admixed with the contents of the duodenum and therefore stained a yellowish green by the bile. After a test-meal hydrochloric acid is found, but in diminished quantity; pepsin and the milk-curdling ferment are also lessened, but form peptone and propeptone. Lactic and the fatty acids are usually, although not always, present.

In chronic mucous gastritis the stomach contains large amounts of mucus both while fasting and after the taking of food. There is usually an absence of hydrochloric acid and peptone is present only in traces, while propeptone usually forms abundantly. The milk-curdling ferment is usually absent. Test-tube digestion is possible only by the addition of hydrochloric acid and its retardation even then indicates the lessening in the amount of pepsin. Between chronic mucous gastritis and simple chronic gastritis, however, many intermediate forms occur and the differentiation is not always easily made.

In the third, or atrophic, variety of chronic gastritis the stomach both while fasting and after the test-meal shows an entire absence of mucus, as well as of hydrochloric acid, pepsin and the milk-curdling ferment. To this form, as has been already intimated, the chronic

[1] Ewald, *Klinik der Verdauungskrankh.*, S. 189.

mucous variety gradually tends, in proportion as more or less complete atrophy of the secretory parenchyma ensues.

Chronic gastritis may be said to depend upon causes that act directly upon the stomach, and are therefore primary; and upon those that act upon the stomach secondarily—first, as the result of changes in the circulation dependent upon lesions of other organs; and, secondly, as the result of changes in the state of the blood itself dependent upon general conditions.

The primary causes of chronic gastritis include all forms of local irritation to the mucous membrane of the stomach. Therefore the ingestion of all substances rendered irritating and difficult of digestion by improper mastication, as well as particles of food with which the saliva has been inadequately admixed and thereby predisposed to fermentation when reaching the stomach, constitute direct irritants to the gastric mucous membrane and are therefore causal in the production of chronic inflammatory changes.

Again, the use of such irritants as alcoholic beverages in a concentrated form, highly seasoned foods, and the irritating condiments will, if sufficiently prolonged, result in the establishment of the disease. In the same manner a carious condition of the teeth should be regarded as etiologically important, for the reason that from this source there may arise putrefaction and decomposition of the retained particles of food and secretions of the mouth, which upon subsequent swallowing constitute sources of irritation leading eventually to inflammation. Here should also be included those cases of chronic gastritis arising from the direct local inflammatory changes accompanying new growths and cicatrices in the mucous membrane, as well as those resulting from the irritation produced by the existence of various forms of parasites within the cavity of the stomach or in some portion of the gastric wall. Repeated attacks of the acute and subacute varieties of the disease frequently lead to chronic gastritis, and this can the more readily be understood when we consider that many of the causes of the former are also productive of the latter. Nor must we overlook the functional disorders of the stomach as causes of the chronic structural changes constituting chronic gastric catarrh.

The secondary causes of chronic gastritis, or those due to changes in the circulation and alteration in the condition of the blood, result, in the first place, from all those conditions giving rise to venous stasis and congestion of the mucous membrane of the stomach. These conditions may be looked for in those diseases of the liver and spleen that produce obstruction to the portal vessels, as well as in chronic disease of the heart, either primary or dependent upon lesions of other organs, as of the lungs. Under any of these conditions the resulting venous congestion of the stomach will lead eventually to

chronic inflammatory changes, and to afford relief to the chronic gastric catarrh it is primarily necessary to relieve the condition upon which the venous congestion depends. As the result of the excretion of toxic substances into the stomach attending the blood-alterations incident to such general diseases as the infectious fevers, chlorosis, and profound anæmia from any cause, as well as gout, diabetes mellitus, chronic nephritis, and tuberculosis, the mucous membrane of the stomach is rendered more than normally sensitive to ingested irritants; hence these conditions predispose to chronic gastritis. In the case of chronic nephritis the excretion of urea in the stomach is probably the causative element, and the same may be said of the absorption into the blood, and subsequent excretion in the stomach, of the putrefactive products arising in the intestinal canal.[1]

Treatment.

The treatment of chronic gastritis must begin with the regulation of the diet, a precaution quite as important as the treatment of the disease by drugs. It is self-evident, however, that the diet must vary with each individual case, and that each individual in this respect must be separately considered. It is, therefore, impossible to prescribe a definite diet-list suitable for all cases, a fact that is readily understood when we consider the varying degree with which the secretory glands are affected and their function disturbed, as well as the differences in the susceptibility to certain classes of food exhibited by even normal individuals. In a general way it may be said that a case of chronic gastric catarrh should be limited to simple and easily digested foods, or foods rendered easy of digestion by artificial means, as without such aid in many cases digestion cannot be properly performed. Even here, however, individual experience must cause the dietary to vary, for what is easy of digestion to one is difficult to another, and what the normal stomach may find easy to prepare for assimilation is difficult to the diseased organ.

In many cases of chronic gastric catarrh a diet of milk must, at least for a time, be resorted to. Although patients soon tire of it, and, as has been stated, a diet exclusively of milk is in a measure effecting a cure by slow starvation, yet in severe and obstinate cases such a strict regulation of the diet becomes necessary. The objection that such a quantity as it is possible to give a patient does not afford sufficient nutritive principles to properly maintain life upon its use alone, is counteracted by the addition to it of milk powders, consisting of milk which has been evaporated to dryness and then pulverized. It is estimated that one hundred grammes of this are the equivalent of one litre of milk; so that the addition of such a quantity to the milk

[1] *Op. cit.*, S. 203.

taken imparts to it greatly increased nutritive qualities. Milk may be administered in its ordinary state or as buttermilk, or it may be previously peptonized. In some cases the addition of Vichy water, a small quantity of bicarbonate of sodium or of common salt will render it more easy of digestion.

In cases of less severity than would call for a strict diet of milk, such a regimen may be supplemented by foods in a semi-liquid form, such as soft-boiled eggs and soups prepared in milk and thickened by thoroughly boiled rice or barley; or well-cooked oatmeal, rendered thin in consistence and carefully strained to remove the indigestible shells of the grain, may be given with advantage. We may also allow the twice-baked or toasted breads, such as zwieback, with a small allowance of butter; tender meats, prepared without fats, therefore roasted or broiled, may be rendered more easy of digestion by scraping. Care should be taken, however, that all fatty and tough portions are removed, and that the meat is not from animals that have been recently slaughtered. In a general way we may say that all meats that contain much fat, and the fatty fish foods, should be avoided, as they readily undergo decomposition in the stomach and are therefore indirectly harmful. The condiments and the concentrated alcholic liquors should be forbidden because of their irritant effects, but weak tea and cocoa may, in most cases, be allowed. After a patient has thus been dieted for several weeks a more liberal allowance of food may be given, and here it may be said that the vegetables and fruits in general are of advantage; and that bread, if well baked and not too fresh, may be allowed. It should be borne in mind, however, that these substances, on account of their saccharine constituents, readily undergo fermentation, and that they should be carefully prepared and used with caution. Especially is this care necessary in all atonic states of the stomach and when the tendency to gastrectasis exists, as in these conditions the prolonged detention of carbohydrates in the stomach promotes their fermentation.

The patient with chronic gastritis should eat more frequently than the normal individual, and at least four meals should be partaken of in the twenty-four hours. He should exercise care in mastication and should eat slowly, and as far as possible dismiss from his mind business and other cares while eating. The meals should not be too large in bulk, and under all circumstances the patient should cease eating before the appetite has been fully satisfied.

The use of mineral waters is undoubtedly of advantage in many cases of chronic gastritis. The best results are to be obtained from saline and alkaline saline waters. The former, containing small or large amounts of carbonic acid, are to be preferred in most cases of the disease. From practical experience their effect appears to be to

increase the production of the gastric secretion and to increase the appetite, as well as to influence favorably the motive power of the stomach. This class of waters is not indicated when marked gastric atony exists or where a high grade of gastrectasis has occurred.[1] In the group of saline springs belong Soden, Homburg, Wiesbaden (*Kochbrunnen*, warm), Kissingen and Sarotoga, Congress Spring.

When constipation exists as a troublesome symptom better results are obtained from the alkaline saline waters, which contain chiefly sodium sulphate, sodium chloride, sodium carbonate, and free carbonic acid gas, and the effects of which depend largely upon the sodium sulphate; of these springs the principal are Carlsbad, Marienbad, Sarotoga Hathorn Spring, Franzensbad and Tarasp.

For the earliest systematic investigations of the action of these waters in disorders of digestion we are under obligations to Jaworski,[2] whose researches were later supplemented by various other observers, notably Spitzer,[3] Ewald, and Sandberg.[4] The conclusions of these various investigators do not seem to agree. Thus, while Jaworski observed a decrease in the secretion of hydrochloric acid and pepsin after the use of Carlsbad waters, Ewald and Sandberg were unable to establish that these waters materially, if at all, decreased the amount of these substances in the gastric secretions. From an investigation of some eighteen cases Spitzer arrived at practically the same conclusions as Ewald and Sandberg. After four weeks' treatment at Carlsbad most of these cases showed an increase in the muscular power, and in none of them did a decrease in this function take place. The influence upon the secretion of hydrochloric acid was somewhat variable: in some instances it was increased and in others diminished; in cases of hyperacidity a rapid decline to the normal took place, but it did not go materially below.

The use of these waters at home, in the bottled form, may be resorted to, but it cannot be so successful as a sojourn at the springs, where the complete rest, the freedom from mental worry, the great care in diet, and the open-air life are all important aids in effecting a cure.

Hygienic conditions must be considered as tending to promote cure in cases of chronic gastritis. An abundance of exercise, especially out of doors, should be recommended; therefore bicycle and horseback exercise, as well as walking, may be resorted to with advantage. At home, when out-of-door exercise is impracticable, the swinging of clubs or the use of any of the exercising apparatus may

[1] Riegel: *Nothnagel's Spec. Path. u. Therap.*, Bd. xvi. Th. 2, S. 285.

[2] *Deutsches Archiv für klin. Med.*, Bd. xxxvii, und *Wiener med. Presse*, 1888, Nos. 3, 4.

[3] *Therapeutische Monatshefte*, April, 1894.

[4] *Klinik*, etc., Bd. ii. S. 243.

be substituted. Exercise should be carefully regulated, however, and care should be taken that it be not overdone. The condition of the skin should also be looked after, and a daily cold sponge-bath with brisk rubbing afterward with a Turkish towel will be found conducive to this end. In many instances advantage will be derived from change of air and occupation, and camping-out in the woods or a protracted sea-voyage may accomplish what the strictest regulation of the diet and the most carefully managed medication will fail to do.

Among the direct means of treating gastric catarrh, lavage, or the washing out of the stomach, will be found to be of the greatest benefit. Of all the remedies tending to increase the functional activity of the gastric secretory glands it gives the best results. Not only is secretion of hydrochloric acid and pepsin furthered by the use of lavage in this affection, but the mechanical effect of the procedure is also of the greatest benefit. No small part of the cure of this disease depends upon the removal of the thick, ropy mucus that clings to the gastric walls and mechanically impedes and interferes with the proper secretion of gastric juice. By the use of lavage this mucus is not only gotten rid of, but the nests of bacteria of various kinds which are imbedded in it, and which multiply with great rapidity, are also removed, and thus one of the most important factors in the production of fermentation is eradicated. The collection of such a mass of thick, tenacious mucus upon the gastric wall not only offers a mechanical obstruction to the pouring out of the gastric secretion, but it also interposes itself between the secretory glands and the food in the stomach. In this way the stimulating effect normally exerted upon the glands by the presence of food in the stomach is interfered with and the glandular secretion prevented.

Thus the good effects following the use of lavage are due to several conditions: the mucus with its contained bacteria is removed, and fermentative and putrefactive processes prevented; a mechanical interference with the secretion of gastric juice is gotten rid of; and the secretory and motor functions are directly stimulated. The mere presence of the water in the stomach and its impact against the gastric wall tend to increase the gastric flow, and especially is this the case when the water is forced in under pressure in the form of a douche. By this latter procedure vasomotor functions are stimulated, and by the increased activity of the circulation more blood is brought to the tissues. From these effects, unless the glandular structure is largely atrophic, the necessary sequence must be a healthy reaction. Degenerative changes are further arrested, and positive relief of the pathological conditions is brought about, by the effect of lavage upon the muscular coat of the stomach. My own experience confirms that of

others in that the effect of washing out of the stomach is to increase its tonus and to stimulate peristalsis. Under its influence, therefore, the food is more quickly advanced and its digestion hastened, thus preventing its long retention in the stomach and consequent fermentation with its tendency ultimately to produce gastrectasis.

Of the various contrivances for lavage that of Ewald is most universally employed. It consists of a piece of soft-rubber tubing about one yard in length, open at both ends, and possessing several fenestræ near the end introduced into the stomach. To the other end a large funnel of about two quarts capacity is attached. After the introduction of the tube into the stomach the funnel is placed in a wooden frame contrived for the purpose, and is then filled with the desired quantity of water. It is then elevated, the degree of elevation being regulated in accordance with the amount of pressure desired. From the various openings the water escapes with some force, and these several streams coming in contact with the wall of the stomach result in detaching the clinging mucus, and otherwise exert a beneficial effect. As soon as a feeling of distention and discomfort is experienced by the patient the further entrance of water should be stopped. This is accomplished by lowering the funnel and again placing it in the rest upon the floor, the funnel refilling from the stomach by siphonage. The wash-water may then be examined and its character determined. These manœuvres should be repeated until the returning water from the stomach is perfectly clean and free from mucus and particles of food.

Another very efficient contrivance is the Leube-Rosenthal apparatus, the use of which is strongly advocated by Einhorn,[1] and which consists of a large glass irrigator of capacity to hold two or more quarts. From this irrigator there leads a long piece of soft-rubber tubing which by means of a Y-shaped glass tube is connected both with the stomach-tube and with a second long piece of soft-rubber tubing, the latter placed in a vessel intended to receive the wash-water from the stomach. The tubing passing from the irrigator to the stomach-tube and the tubing passing from the stomach-tube to the wash-vessel are each provided with a clamp, so that by opening the clamp upon the former and closing that upon the latter the water passes into the stomach, while closing the former and opening the latter permits the wash-water to pass out of the stomach into the vessel provided for that purpose. Repeated washings should be resorted to at each sitting until the wash-water returns from the stomach free from mucus and particles of food. In order to facilitate the dislodgement of mucus from the walls of the stomach and to render its removal through the tube more ready of accomplish-

[1] *Twentieth Cent. Prac.*, vol. viii. p. 182.

ment, Einhorn advises that the patient shake himself while the water is passing into the stomach.

The same result may be obtained by following the suggestion made by Fleiner[1] that, after washing out the stomach while the patient is in the sitting position until the wash-water returns clear, the patient be allowed to lie down and the lavage further continued while in this position. As a result of this manœuvre it often happens that additional particles of food will be removed when previously the wash-water has returned perfectly clear.

In the early period of the treatment of a case of chronic gastritis lavage should be practised daily, while the stomach is presumably empty, and never, therefore, soon after the taking of a meal. For these reasons the operation is best performed in the morning before breakfast and again before retiring for the night. Of course such frequent lavage is necessary only in the severest forms of the disease, and in most cases a single daily lavage, before the first meal of the day, will prove quite sufficient. After the continuance of the treatment for ten days or two weeks the frequency of the lavage may usually be diminished, and the stomach then be washed out every other day. As the treatment progresses the frequency may be still further diminished, until finally it may be stopped altogether. While this is true of many cases, it is not true of those in which permanent and irremediable changes have taken place in the stomach-wall leading to gastrectasis. In this class of cases the daily lavage of the stomach becomes as much a part of the daily routine of the patient's life as his daily bath. Nor is its use to be regarded as a hardship, for these patients easily acquire the ability to themselves introduce the tube with facility and without inconvenience, while the alleviation of the distressing symptoms that it accomplishes more than compensates for any troublesome and disagreeable features attending its employment.

In the use of lavage care should be taken not to introduce too large a quantity of water into the stomach. It should be borne in mind that the tendency in all forms of chronic gastritis is toward atrophy of the stomach and gastrectasis. Therefore it seems to me an injurious procedure to introduce into a stomach with weakened walls, and already, perhaps, beginning to undergo dilatation, a large quantity of fluid that by its mere weight alone can only hasten the development of gastrectasis, or at least produce gastroptosis. It is by far too common a practice in such cases to keep pouring water into the stomach until the patient complains of some discomfort, a result sometimes not obtained until several quarts of water have been intro-

[1] *Volkmann's Sammlung klinischer Vorträge*, Neue Folge, 1894, No. 103. Referat. Riegel, *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 288.

duced. Such a method of conducting lavage can only tend to aggravate the condition that it was the object of the treatment to alleviate. It would appear more rational, therefore, in this class of cases to provide for the return of the water immediately after its introduction, or at least to retain a ready means of controlling the quantity in the stomach at any one time. This can be readily accomplished by means of the double tube, the water being forced into the stomach under pressure, that none of the mechanical effects of lavage shall be lost. According to my experience the combination of lavage and the gastric douche accomplished by thus forcing the water into the stomach under pressure, and through a tube provided at its end with a number of small openings, has been attended with marked success. The mucous membrane of the stomach is in this way given what is practically a needle douche, while through the return tube the mucus and particles of food pass out into the wash-vessel.

These numerous streams impinging with force upon the mucous membrane detach the mucus clinging to its surface more readily than will the ordinary method of lavage; and, what is of more importance, the effect upon the circulation cannot fail to be attended with good results. The vasomotor centres are stimulated, a better blood-supply seeks the stomach, and degenerative processes are more likely to be retarded or arrested. By this method, also, the muscular coat of the stomach must be stimulated to a greater degree than by lavage as ordinarily practised, so that peristaltic movements will be increased and the tendency to the prolonged retention of food within the stomach obviated.

In electricity we possess another important and oftentimes efficient means of treating chronic gastric catarrh, and we see frequently illustrated in practice the truth of Goldschmidt's[1] statement that the direct electrization of the stomach is not only an important means of combating the nervous disorders of the stomach, but is also of good service in those gastric affections possessing an organic basis.

While some doubt exists as to the manner in which electricity acts in gastric disorders, it is probable that its use in chronic gastritis promotes the secretion of the proper gastric juice as well as increases the activity of gastric peristalsis. The former result is accomplished by the action of the electrical current upon the gastric secretory glands through its effect upon the innervation of the organ, while the latter is brought about by the effect of the current upon the muscular coat. Thus we have relieved many of the symptoms of the disease which are dependent upon diminution or absence of hydrochloric acid, and by the stimulation of the glands to renewed activity further degenerative processes are retarded or prevented.

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 306.

The effect of the current upon the muscularis, and the resulting increased activity of peristalsis, can but add to the tonicity of this structure, thus preventing the too long retention of food within the stomach and preventing the development of gastrectasis to which many cases of chronic gastric catarrh tend. That the electric current thus brings about its favorable results in chronic gastritis is a mere conjecture which, whether true or not, matters little as regards the practical results; for, as Einhorn remarks in this connection, "The chief factor in determining the efficacy of any means of treatment is, and always will be, experience."

There now remains but little doubt as to the comparative value of direct gastric electrization over the introduction of the electrical current through the tissues of the abdomen, the so-called percutaneous method. By the latter method the current must be so diffused in its passage through the abdominal wall that it is doubtful if any portion of its effects arrive at the stomach, or at least these effects must be then so attenuated that but little good will result. Nevertheless, that some good follows the use of the percutaneous method has been demonstrated by many observers, and its employment in preference to direct electrization has been especially advocated by Von Ziemssen,[1] in whose opinion the results obtained by the latter method are not sufficiently great to justify the straining and exhaustion attending the introduction of the electrode into the stomach. The same observer further contends that intragastric electrization is insufficient because, owing to the left direction of the axis of the œsophagus, the electrode in its introduction is deviated in this direction and hence invariably comes in contact only with this portion of the greater curvature, and that as a result the organ is influenced only in part and not in its entirety.[2] It has, however, been sufficiently demonstrated that the introduction of the electrode into the stomach after the viscus has been partially filled with water results in the uniform transmission of the current in different directions, and that all that portion of the organ below the level of the water will be influenced. If for any reason, however, in any individual case direct gastric electrization be deemed inadmissible or inadvisable we may substitute for it the percutaneous method with the expectation of obtaining at least a considerable degree of benefit. In this procedure one electrode is placed upon the epigastrium while the other is placed upon the back near the fifth or sixth dorsal vertebra, and to the left of the vertebral column.

With the introduction of new methods in direct electrization the principal objections to the procedure have disappeared. With the older technique it was necessary for the patient to retain the stomach-

[1] Riegel, *Nothnagel's Specielle Path. u. Therap.*, Bd. xvi. Th. 2, S. 308.

[2] *Klinische Vorträge*, 1888, No. 12.

tube, through which passed the wire to the electrode, within the stomach throughout the entire séance. The effect of this prolonged retention of a thick tube in the œsophagus was to produce a great deal of gagging and straining, followed by more or less exhaustion, and for these reasons the intragastric applications of electricity met with much adverse criticism.

That internal or direct gastric electrization has been brought within the range of practical therapeutics is undoubtedly due chiefly to the experiments of Einhorn, and his invention of the device named by him the deglutable stomach-electrode. This instrument consists of an electrode about the size and shape of an almond, the component parts of which are a hard-rubber capsule possessing multiple openings and, within the capsule, a metallic button connected with a thin wire which serves as a means of communication with the battery; the wire passes through a very fine rubber tubing. The object of the hard-rubber capsule is to prevent the metallic button from coming into direct contact with the stomach, while the multiple openings in the capsule permit contact between the metallic button and the water within the stomach, and through this medium the circuit is completed.

Ewald[1] has modified the apparatus of Einhorn to the extent of running the thin wire connecting with the electrode through rubber tubing of greater thickness than that previously advocated. This, he considers, renders the instrument more ready of introduction in those persons who find the swallowing of the capsule difficult, or in whom the capsule has a tendency to lodge in the œsophagus. The size of this tubing corresponds to Carrière No. 13, and the thickness of its walls is about one and a half millimetres. With this tubing the operator is able to introduce the electrode in very much the same manner used in the introduction of the ordinary stomach-tube, and is not obliged to depend entirely upon the ability or willingness of the patient to swallow it.

Before the application of direct electrization the patient should be properly prepared, and for this all that is necessary is that he should take, upon an empty stomach, one or two glasses of water. The electrode is then introduced by passing the capsule as far back as possible upon the tongue, and the patient is then told to swallow, the deglutition of the instrument being facilitated by the patient again drinking some water. As soon as the electrode is within the stomach, a fact readily ascertained by placing a mark upon the rubber tubing at the proper point, the electricity may be applied.

The technique of the procedure is, perhaps, best explained by the following quotation from Einhorn:[2]

[1] *Klinik der Verdauungskrankh.*, Dritte Aufl., Bd. ii. S. 95.

[2] *Twentieth Century Practice*, vol. viii. p. 191.

"The patient, when the deglutable electrode is within the stomach, opens his clothes, so that the abdomen is accessible. The key of the deglutable electrode is connected with the cord (negative pole) running to the battery.

"*Gastro-faradization.*—Sitting, ten minutes; at first the large plate electrode at the gastric and epigastric region for five minutes, then a small ordinary sponge electrode. The electrode is at first moved up and down from left to right in the gastric region; sometimes, especially when there is constipation, the electrode is passed over the region of the colon—ascendens, transversum, and descendens—always beginning in the right iliac region and stopping at the left iliac region (duration, two minutes); we then proceed from the gastric region from right to left to the back, and remain at the left side of the seventh dorsal vertebra for one minute. At this place the current can be applied quite strongly, and most patients then experience a slight sensation within the stomach: the patients find it difficult to describe this sensation; some assert that they experience a dragging feeling, others a feeling of weight, and others again a feeling of pinching. All of them refer the feeling to the stomach, and locate it opposite different heights of the abdominal wall. We then return to the front, moving the electrode gently up and down over the gastric region for two minutes, gradually decreasing the current, and thus end the sitting. The current must be of such a strength that it causes distinct contractions of the abdominal walls, but it is not well to have it so strong that the patient experiences pain.

"*Gastro-galvanization.*—Negative pole within the stomach; small sponge electrode. Duration, eight minutes. First, for two minutes below the ensiform process (during first minute the current is gradually increased to its necessary strength), then for three minutes moving the electrode up and down the gastric region. After this we go to the back and remain one minute at the left side of the seventh dorsal vertebra, return to the front, move the electrode around the gastric region for one minute, and then remain quietly for one minute below the ensiform process. During this time the current is gradually weakened and the sitting is ended. The strength of current is ordinarily fifteen to twenty milliampères.

"In withdrawing the electrode a resistance is felt at the introitus œsophagi; it is not advisable to pull the electrode with force. One has only to make the patient swallow once or twice, and to make use of the moment when the larynx, by this act, ascends and the passage becomes free to withdraw the electrode, which is now done with perfect ease."

In chronic gastric catarrh direct gastro-faradization should be used in preference to the application of the galvanic current, for the reason

that its effects are to stimulate the secretory functions of the stomach and hence increase the output of hydrochloric acid. The good results obtained from the galvanic current are seen especially in the gastric neuroses, and particularly in those forms characterized by pain. The usefulness of this current in chronic gastritis, therefore, finds its best expression in those cases characterized by sensory disturbances, especially the severe gastralgias sometimes attending the affection. This difference in the effects of the two currents is especially insisted upon by Goldschmidt, who recommends the employment of intragastric galvanization (positive pole in the stomach) more for the painful affections of the stomach, while he restricts the use of the faradic current to those conditions of the stomach characterized by a disturbance of its function.

The electrical treatment of the stomach in chronic gastritis should be conducted frequently. During the earlier part of the treatment the sittings should be every other day, and should thus continue for three or four weeks; or the frequency of administration may be earlier diminished if there be a marked amelioration of the symptoms. The number of sittings may then be reduced to two weekly, and then to one weekly, and should be continued for some time after the disappearance of the symptoms.

While electricity affords us a valuable means of treating this at times very troublesome disease, there are those whose conclusions are entitled to earnest consideration who consider it inferior to other means at our command. Rosenheim, in particular, has not observed the favorable result so ardently claimed for electricity in the secretory diseases of the stomach, and believes that more can be accomplished by medication supplemented by lavage, or even by medication alone.

In considering the use of drugs in chronic gastric catarrh, our thoughts naturally turn first to hydrochloric acid. The use of hydrochloric acid in this disease is of course suggested by the character of the anatomical changes that occur, and the absence or diminution of the quantity of hydrochloric acid in the gastric secretions dependent upon these anatomical changes. Therefore, by the administration of this drug we endeavor to replace an important constituent of the gastric juice temporarily or permanently absent from it. It is important to bear in mind, however, that not every case showing a diminution of the normal quantity of free hydrochloric acid calls for its artificial replacement, as in many instances the diminution or even entire absence of hydrochloric acid will be found to depend upon the simple abeyance of the secretory functions of the stomach, and not upon advanced atrophic changes in the secreting structures. In cases of this character the indication is to stimulate the functions of the

stomach that for the time being are inactive rather than to artificially administer a substitute. The secretion from the gastric glands is rendered more efficient under the influence of a proper stimulus, and if, instead of so stimulating the function of the glands, a drug such as hydrochloric acid be administered, the demand made upon the secretory structures is lessened, and the activity with which their function is performed will be diminished. In this way we would defeat our ultimate object, as the maintenance of a proper degree of health of a tissue depends upon continued activity, while inactivity leads to atrophy and loss of function. Therefore, in this class of cases, better results are often obtained by resort to the mechanical means of treating the stomach, especially lavage and electrization, and by the administration of that class of remedies generally called the stomachics.

In those instances of chronic gastritis in which hydrochloric acid is persistently absent or markedly diminished in amount, and in which these changes are dependent upon advanced structural lesions, the administration of hydrochloric acid becomes of the utmost value. By its action stomach-digestion is materially aided and the administration of albuminous articles of diet rendered permissible. When it is deficient in the gastric contents the artificial use of hydrochloric is further indicated on account of its disinfectant and anti-fermentative properties. Under ordinary circumstances the most important feature in the prevention of fermentative processes within the stomach is to be found in the hydrochloric acid of the normal gastric secretions. In those diseases of the stomach characterized by an absence of this constituent, fermentation and decomposition of the gastric contents readily takes place, especially as then gastric digestion is much delayed and the food is retained for an undue length of time. Under these circumstances much benefit is derived from the administration of hydrochloric acid. In these cases the dose of the drug should be a large one—20 to 30 drops, well diluted—as it is difficult to conceive of much benefit arising from the ordinarily prescribed dose of 10 drops when we consider the degree of dilution it undergoes when admixed with the contents of the stomach, and if we further reflect that some forms of fermentation are not seriously interfered with by small amounts of hydrochloric acid. While hydrochloric acid is valuable for its anti-fermentative properties, it must not be forgotten that in lavage we possess a much more efficient and more certain means of combating this condition.

Riegel[1] also ascribes to hydrochloric acid the properties of a stomachic, at the same time stating that the manner in which it acts is not well understood. He advises, in order to obtain the stomachic

[1] *Nothnagel's Specielle Path. und Therap.*, Bd. xvi. Th. 2, S. 260.

effects of the drug, that it be administered about a quarter of an hour before meals instead of afterward, and in small doses rather than the large doses prescribed under other circumstances; and further states that, administered in this way, it is not uncommon to find the appetite increase and the ability of the patient to take more nourishment enhanced.

Hydrochloric acid is best administered in the form of the diluted acid usually employed. It should be given after meals in doses of from 15 to 20 drops, or more, largely diluted with water, care being taken to protect the teeth by the taking of the medicament through a glass tube. It is perhaps better not to take the entire dose at one time, but rather to divide it into three or four portions to be taken at intervals of about half an hour. In my experience the very large doses advocated by Ewald and others have proven unnecessary, and a dose of 20 drops taken three times daily in accordance with the method described should be regarded as the maximum amount required.

The digestive ferments, and in particular pepsin, were, until a recent period, largely employed in the treatment of digestive disorders, and especially in the management of chronic gastric catarrh, in which affection this ingredient is so frequently lacking from the gastric secretions. Of late, however, the use of this class of remedies has fallen into deserved discredit, for the reason that recent investigations have conclusively proven that whenever free hydrochloric acid exists in the gastric secretions, even in diminished quantities, pepsin is always to be found in sufficient amounts for the purpose of digestion. Even in those instances in which hydrochloric acid is totally lacking, and which therefore show also an absence of pepsin, there still will be present in the gastric secretions, in the vast majority of such cases, the zymogen of pepsin, or pepsinogen, from which with the administration of hydrochloric acid pepsin will be produced in abundance. The cases of chronic gastritis in which pepsinogen is absent from the gastric secretions are of very infrequent occurrence, and even in this class of cases the inutility of pepsin must be admitted when we consider the disproportion between the digestive powers of the pepsin ordinarily sold and the pepsin of the normal gastric secretion.

What is true of pepsin is also true even to a greater extent of the other digestive ferments, such as papain and pancreatin, so largely and indiscriminately employed in the treatment of disorders of digestion. It is true that when our knowledge of diseases of the stomach lacked the precision that at the present day it has attained, the use of these medicaments seemed, upon theoretical grounds at least, to be indicated. Since closer observation and the more scientific considera-

tion of the subject have proven the facts just mentioned, it seems to me that the use of the digestive ferments, at least in chronic gastric catarrh, can be abandoned with advantage, and that our efforts should be directed toward the stimulation of the secretory functions of the stomach, particularly by the physical means at our disposal.

For a long time past practical experience has demonstrated the value of the so-called bitter tonics, or stomachics, in the treatment of disorders of digestion, although the manner in which they act is still somewhat of an open question. It is claimed for some of these remedies that they directly stimulate the secretion of the gastric juice, and for others that their powers to aid digestion depend largely upon their ability to increase the motor power of the stomach, and that they thus lessen the period during which the food remains within the stomach, where the digestive function is feeble. That this class of remedies increases the appetite is a well-known fact.

We are under many obligations to Reichmann[1] for a very careful investigation of the mode of action of the bitter tonics. These researches are of more value in that they were conducted upon patients suffering from disorders of digestion rather than upon animals, as were many of the previous investigations. The results in some of the latter seemed to prove that, so far from the secretion of hydrochloric acid being stimulated after the administration of the bitters, their exhibition was actually followed by its lessening. Reichmann chose for his experiments the two groups of bitter stomachics, the simple bitters and the aromatic bitters, but no great difference in the action of the different members of the two classes of drugs could be established. He found that there follows *immediately* after the introduction of a bitter infusion into the fasting stomach less secretory activity than followed the administration of distilled water, but that after the passage of the bitter from the stomach a notable increase in the amount of hydrochloric acid occurred. The bitters appear to have no effect in stimulating the secretion of hydrochloric acid, or in increasing the digestive functions of the stomach, in those cases in which the gastric secretion is normal or nearly so. In cases, however, in which hydrochloric acid is diminished in amount or is absent altogether, provided this absence is due to a simple abeyance of function, its increase follows the use of the bitters. Of course in those cases of chronic gastric catarrh in which the pathological changes have proceeded to more or less complete atrophy and destruction of the glandular structure of the stomach, the use of the bitters is not indicated, as no secretory structure remains to be stimulated.

The bitter tonics, therefore, are to be prescribed only in those cases

[1] *Zeitsch. für klin. Medicin*, Bd. xiv.; referred to by Riegel in *Nothnagel's Path. u. Therap.*, Bd. xvi. Th. 2, S. 270.

in which the activity of the secretory glands is diminished; and, for the reason that no increase in the amount of hydrochloric acid takes place until after the disappearance of the remedy from the stomach, they must be taken about half an hour before meals.

Of course the results derived from the use of the bitter tonics, as from all measures calculated to stimulate the gastric secretions, will depend greatly upon the intensity of the gastric inflammation and the extent to which the glandular structure is capable of giving a response; and it seems to me that this fact explains somewhat the differences of opinion as to whether the bitters act favorably by increasing gastric secretion or simply by their influence upon the muscular tone. In those cases in which digestion is retarded or rendered difficult by weakened muscular activity much benefit is to be derived from the use of nux vomica or strychnine, its alkaloid, which has long been considered as possessing especial effects upon the muscular tone as well as upon the glandular activity. Of the various bitters it is my experience that the greatest benefit is to be derived from nux vomica or strychnine, and especially in those cases of gastritis of alcoholic origin. Next in efficiency I would place condurango, gentian, and quassia, although the remaining members of the group of stomachics, such as calumba, kino, chamomile, cardamom, ipecac, etc., are each of value, and one scarcely knows what influences him in choosing one rather than the other in a given case. These drugs may be given alone, but it is more usual to give several of them in combination, and such combinations as nux vomica with gentian, or with condurango and belladonna, seem to be more efficacious than the administration of the single drug.

The management of some special symptoms requires a brief mention. One of the most persistent and, at times, troublesome conditions associated with chronic gastric catarrh is constipation. In cases where the condition of the stomach will permit of it, a regulation of the diet with special consideration as to the condition of the intestines will be found of value. Therefore the use of foods containing a large proportion of residue, increasing the quantity of the intestinal contents and thereby stimulating the peristaltic movement, will be found in many cases all that is required for the relief of constipation. So also the use of fruits, fresh or stewed, prove simple and often efficacious means of overcoming this condition.

Enemata and laxative suppositories, such as those of glycerin, may be resorted to, especially in cases in which want of tone of the large bowel exists and in which hardened fæcal masses tend to accumulate in the descending portion; these measures tend to increase the muscular activity and to soften the retained fæces and render them easy of evacuation.

Among drugs, we find benefit derived from rhubarb, senna, taraxacum, occasionally mercury in small doses, aloes, podophyllin, jalap, colocynth, and cascara sagrada. Certain of the aperient mineral waters may also be used with advantage, and in some cases, where action upon the small intestines is desired, good results are obtained by resort to the saline cathartics.

To all measures for the relief of constipation the patient is only too apt to become habituated, a tolerance being thus established. No such means of relief, therefore, should be too long continued, and drugs should not be resorted to if it be possible to alleviate the condition by the more simple methods described.

So much has been said about the anti-fermentative action of hydrochloric acid and the effect of lavage in removing the products of fermentation that further consideration of the symptoms arising from fermentation and decomposition of the food in the stomach seems hardly called for. Nevertheless, in some cases lavage is impossible, and then other measures must be resorted to. For the relief of the condition in many cases a careful regulation of the diet is all that will be found necessary, and, indeed, in all cases presenting this condition the regulation of the diet constitutes an important preliminary to the administration of drugs, for when the stomach contains a large mass of fermenting and decomposing material it becomes impossible to counteract these changes without giving drugs in such doses that their tolerance by the stomach is impossible. Thus, reducing the possibility of fermentation to a minimum, we may obtain excellent results from various anti-fermentative and antiseptic remedies. Among these may be mentioned resorcin, carbolic acid, bismuth salicylate, naphthalin, beta-naphthol, etc. The best among this class of remedies, however, will be found to be thymol and creasote, and the latter will be found to be especially valuable in the chronic gastric catarrh of phthisis. These remedies may be administered one or two hours after eating. and the dose may be repeated in one or two hours, should a single dose prove insufficient to accomplish the purpose intended. In some instances fermentative symptoms are relieved by the use of antacids, especially bicarbonate of soda, administered alone or preferably in combination with bismuth. As pointed out by Ewald, however, the effect of the alkalies in this condition is one of palliation, and by their use the cause upon which the process depends is favored rather than opposed.

Gastralgia is a symptom at times requiring treatment in the course of chronic gastric catarrh. As already pointed out, this symptom in many instances may be promptly relieved by gastro-galvanization with the positive pole (Goldschmidt) within the stomach and a small sponge electrode upon the epigastrium. It must also be remembered

that many of the measures already mentioned in the treatment of the disease itself will exert a beneficial action upon this symptom should it be present; particularly is this true of lavage and the gastric douche. Among drugs I have obtained the best results from cannabis indica, sulphate of codeine, and nux vomica, especially when given in combination. I am in the habit of prescribing them in pill form, as follows:

℞. Codeinæ sulphat., gr. iij (0.18);
Ext. cannab. indic., gr. ij (0.12);
Ext. nucis vom., gr. iij (0.18).
M. et ft. pil. No. xii.
Sig. One pill to be taken three times daily after meals.

Belladonna, hyoscine, hydrocyanic acid, Hoffman's anodyne, and spirit of chloroform may also be used for the relief of this symptom. When gastralgia is resistant, however, recourse must be had to the hypodermic use of morphine for its palliation. In a chronic disease of this character, the danger of thus establishing the opium-habit must be pointed out.

Vomiting is a symptom that is best treated by lavage. It is not frequently that it demands special attention.

In the brief discussion of the etiology of chronic gastritis it was pointed out that many cases were of secondary origin, depending upon diseases of other organs, or upon some general constitutional conditions. Under these circumstances the primary necessity of relieving this condition before the gastric changes can be effected becomes apparent. Thus in hepatic cirrhosis, chronic cardiac and pulmonary diseases, and renal disease, the primary cause of the changes within the stomach must be eradicated before relief of the gastric symptoms can be hoped for. The same may be said of the chronic gastritis accompanying chlorosis and other forms of anæmia, and I have repeatedly seen marked improvement follow the administration of iron and other blood-making remedies when previous treatment of the case upon a pure gastric basis had failed.

DILATATION OF THE STOMACH, OR GASTRECTASIS.

As to what constitutes a pathologically enlarged stomach cannot always be determined by an estimation of the capacity of the organ, as wide variations in the size are found to occur in individuals who give no evidence of gastric disorder. Of the stomachs examined

post-mortem by Von Ziemssen, taken from individuals of about the same size with a view of determining a standard for the capacity of the organ in health, the largest was found to hold 1680 c.cm., while the smallest would hold but 250 c.cm. More recent investigations conducted by Pepper and Stengel[1] would show that even greater enlargement may exist and symptoms of gastrectasis be absent; thus the largest stomach of the series examined by these observers gave a capacity of 2600 c.cm.

In none of the individuals from whom these stomachs were taken had there been any digestive disturbances complained of during life. From its capacity alone, therefore, a stomach cannot be said to be pathologically dilated unless such capacity be in excess of 1700 c.cm. On the other hand, it can be readily understood that a stomach the normal capacity of which is approximately 250 c.cm. might in reality be very greatly dilated by some pathological condition, even though in capacity it did not approach the limit mentioned above. We must learn to depend, therefore, more upon the symptoms to determine the existence of ectasia ventriculi, or at least associate these symptoms with the evidences of increased capacity. To that condition in which the stomach is enlarged but in which no symptoms of dilatation are present, Ewald has given the name megastria; while the term gastrectasis is restricted to those cases presenting not only the physical signs of dilatation, but also the symptomatic evidences of functional insufficiency. Fortunately these symptoms are distinctive and leave the diagnosis in but little doubt.

Dilatation of the stomach occurs either as a result of changes primarily affecting the gastric walls, or else as the result of a mechanical obstruction at the pylorus to the passage of the stomach-contents into the intestines. Dilatation due to the first group of causes in certain rare instances develops acutely and is then dependent upon rapid overfilling of the viscus. This form is sometimes seen after eating and drinking contests, and fatal results have been recorded. Repeated and habitual overfilling of the stomach, however, may give rise to dilatation of the chronic variety, producing atony of the muscular coat by subjecting it to excessive demands. On the other hand, chronic dilatation of the stomach occurs from atony of the gastric walls incident to the chronic degenerative changes accompanying chronic inflammatory diseases of the stomach. It has already been pointed out how in chronic gastritis the tendency of the affection is toward complete atrophy of the secretory structures of the stomach, and how, from the consequent diminution or absence of the proper gastric secretions, digestion is delayed and the food retained for an undue length of time within the stomach. It has been further pointed out

[1] *American Journal of the Medical Sciences*, Jan., 1897.

that in chronic gastritis the motor power of the stomach is lessened and peristaltic movements enfeebled, and that this, added to the alteration in the secretions, tends still further to postpone the period when the gastric contents are passed into the intestines. This prolonged retention of food within the stomach, with the resulting fermentative processes and overdistention of the organ by the gases evolved, tends to mechanically interfere with the nutrition of the gastric walls and to promote their insufficiency. If these conditions could arise in a perfectly healthy organ its dilatation would probably take place; how much more, then, is it likely to occur when the gastric walls are atonic and atrophic as in chronic gastric catarrh!

Insufficiency of the muscular power of the stomach, either relative or absolute, may arise in conditions of general asthenia, the gastric muscularis in these instances simply sharing in the general atony of the muscular system at large. In this way can be explained the gastrectasis accompanying cachectic states such as cancer, profound anæmia, diabetes, Bright's disease, tuberculosis, etc. The stomach shares in the general malnutrition, its muscular power is lessened, gastric digestion is retarded, fermentation results, and as the result of the consequent overdistention dilatation develops. If, with a stomach the nutrition of which is thus impaired, the patient suffers from an abnormal appetite—as, for instance, in diabetes—it can be readily understood how aggravated the condition may become.

As Ewald has pointed out, gastrectasis may result from the weakening of the expulsive powers of the stomach by the "exclusion of a more or less sharply bounded portion of the muscular fibres of the stomach." This may be brought about by the destruction of a portion of the gastric muscle due to cancerous growth or extensive ulceration, so that complete gastrectasis occurs, or, at least there takes place a dilatation of that part of the stomach behind the obstruction offered to peristalsis by the areas in which the muscle-fibres have been destroyed.

Dilatation of the stomach is also said to occur as the result of lessening of the excitability of the nervous mechanism governing peristalsis, or paresis of the nerve-fibres presiding over the motor functions of the stomach. These conditions, as a rule, depend upon some reflex inhibitory influence, or are due to the effects of the local lesions of the stomach already dwelt upon.

The greatest degree of gastrectasis is to be found in those cases dependent upon a mechanical obstruction at the pylorus. This at once disturbs the relationship existing between the normal muscular activity and the amount of resistance normally offered by the pylorus. Consequently undue demands are made upon the muscularis, to meet which hypertrophy of the muscular coat at first takes place. As the

degree of the obstruction increases, however, and develops in excess of the ability of the gastric muscle to overcome it, stretching of the stomach-walls takes place, the individual muscle-fibres become separated, and gastrectasis occurs. The most common cause of pyloric obstruction is undoubtedly carcinoma, the pylorus being the most frequent location of gastric cancer. Another cause of common occurrence is to be found in the cicatricial contraction following the healing of an ulcer in the immediate neighborhood of the pylorus. Under these circumstances it is not necessary for the cicatrix to directly involve the pylorus, as obstruction of the orifice may be brought about by the inflammatory infiltration of the tissues in the vicinity of the cicatrix. Again, obstruction may be caused by a pedunculated polypus, carcinomatous or not, springing from the stomach-wall near the pylorus and dropping down into the pyloric orifice and producing obstruction very much as would a ball-valve. This, however, must be considered as one of the rarer causes of pyloric obstruction. Congenital stenosis of the pylorus also occurs, and may be classed among the rarer causes of gastrectasis. Stenosis of the pylorus may also be brought about by pressure from without the stomach or by its involvement in the growth of neoplasms arising in the viscera adjacent to it. Thus from tumors of the pancreas, the liver, or the gall-bladder, of the retroperitoneal glands, or the omentum, pressure may be exerted upon the pylorus occluding the outlet. The same condition is said to result from a displaced right kidney, but, as is insisted upon by Ewald, the kidney must have become fixed in its abnormal position in order that it may interfere with the passage of chyme through the pylorus. If a kidney be a wandering one its mobility is implied, a fact that would prevent it from exerting an occluding pressure upon the pylorus sufficiently prolonged to induce dilatation.

Gastrectasis dependent upon pyloric obstruction can only in the beginning be considered as due to purely mechanical conditions. It can be regarded, for instance, as only in part analogous to the dilatation of the left ventricle of the heart following aortic stenosis, because as soon as the pyloric stenosis persists for a sufficient length of time to give rise to any degree of gastrectasis the gastric contents are delayed in their passage into the intestines and fermentative processes take place. There therefore develop, in addition to the pyloric stenosis, other conditions which in themselves are no less important in the etiology of the affection.

Treatment.

The treatment of dilatation of the stomach should be directed toward checking the development of fermentative processes within the stomach, and preventing the retardation of the gastric contents by

compelling them, if possible, to pass downward into the intestines. When this cannot be accomplished the withdrawal of the fermenting stomach-contents by the stomach-tube becomes necessary. In addition, the diet must be carefully selected, while gastric digestion should be assisted as much as possible, and even at times replaced or supplemented by rectal alimentation.

To prevent fermentative processes developing in the gastric contents, various antiseptic and anti-fermentative remedies have been suggested. Among them may be mentioned salicylic acid in doses of from 5 to 10 grains, or the salicylate of bismuth in somewhat larger doses. Carbolic acid in minim doses, or creasote in doses of from 1 to 5 minims may be given several times during the course of the day. In hydrochloric acid we possess one of the very best anti-fermentatives, and it may be taken in large doses, well diluted, at frequent intervals during the day. Of all the means at our disposal, however, for arresting or preventing fermentation of the gastric contents, none compare in efficacy with lavage. By this procedure we prevent the undue retention of the food within the stomach and thus remove the condition upon which the fermentative processes primarily depend. It is in the treatment of gastrectasis that the most satisfactory results are obtained from lavage in gastric therapy. The frequency of the operation should be regulated in accordance with the requirements of each individual case; in many instances lavage twice daily will be found necessary, and then the times chosen should be the evening before retiring and the morning before the first meal. If the case require more frequent washing out, care must be taken to allow for all the time possible during which digestion of the food is likely to take place. This precaution must be exercised in any case, so that from five to seven hours should be allowed to elapse after eating before the stomach is washed out. The lavage should be continued until the wash-water returns perfectly clear, and especially is free from lumps of food or masses of mucus. As already pointed out in the consideration of lavage in the treatment of chronic gastric catarrh, by causing the patient to change from the sitting to the recumbent posture during lavage fresh surfaces of the gastric wall are brought under the influence of the irrigation, and masses of food and mucus removed that could not be reached without this variation of the usual method. At the conclusion of the lavage many cases are benefited by irrigation of the stomach by some anti-fermentative solution. Thus Einhorn recommends the spraying of the stomach with a 1–3:1000 solution of nitrate of silver; or for this purpose may be used with advantage a 3 per cent. solution of salicylic acid, or a weak solution of potassium permanganate, resorcin, naphthalin, or a 2 per cent. solution of borax.

In gastrectasis, or when a tendency to the condition exists, lavage

should be carried out with great care. It must be borne in mind that one of the most important causes of the condition is the prolonged retention and the accumulation of food within the stomach; by mere force of pressure these do much to bring about dilatation. It seems to me irrational, therefore, that in the treatment of this disease by lavage we should pour into the stomach large quantities of fluid at one time, usually being guided before the withdrawal of the wash-water by the statement of the patient that the stomach is distended to its utmost capacity. This I have frequently witnessed, and I cannot but believe that the overdistention of a stomach already greatly atonic, and its subjection to the weight of such a large body of water as is often required to fill it, must result in an aggravation of the condition we seek to relieve. Particularly is this of importance in those cases where gastroptosis exists in association with gastrectasis. I believe, therefore, that in these conditions better results are obtained by allowing only small quantities of water to pass into the stomach at a time; or, better still, that the irrigation of the stomach should be performed with a double tube in order that the wash-water should be returned as rapidly as it is passed into the stomach, so that the quantity allowed to remain in the stomach at one time may be readily regulated. This can be done and the advantage of lavage not be lost, if the end of the stomach-tube be provided with a number of small openings and the water forced in under pressure. This produces what is practically a needle douche, and these multiple fine streams impinging with force against the gastric mucous membrane effect the more ready removal of the mucus and particles of food clinging to it than does the ordinary method of lavage; as soon as dislodged these substances find their way out through the return tube. With the tube still in place the stomach may be irrigated with the selected antiseptic solution.

The effect of lavage in relieving the obstinate constipation which is present in many cases of gastric dilatation is a circumstance that has been noticed by many observers (Ewald, Kussmaul) and I have had frequent opportunities of attesting its value in this particular. Lavage is of the utmost importance as a remedial agent in the treatment of gastrectasis; in many instances an actual cure may result from its use, although, unfortunately, in a large group of cases, particularly those dependent upon a true stenosis of the pylorus, the results are but palliative. Even in this group of cases, however, the relief afforded to the distressing symptoms is a striking one.

Massage of the stomach acts beneficially in some cases by forcing the gastric contents into the intestines. It is obvious, however, that this can be regarded only as a procedure supplementary to lavage, and it is attended by the possible ill effects of driving into the intestine substances that cause irritation of its mucosa because they are

too highly acid to be neutralized by the intestinal secretions. The method is applicable only to those cases of dilatation arising from benign stenosis of the pylorus, and to those cases due to causes other than pyloric obstruction.

Gastro-faradization, both by the intragastric and the percutaneous methods, has proven of advantage in the treatment of this condition. Particularly is this true of the former, although the application of this agent should be restricted to those cases of dilatation that are due to atony of the muscular coat of the stomach, with its consequent relaxation; it is of but doubtful advantage in those cases dependent upon stenosis of the pylorus. The direct application of the faradic current to the stomach stimulates the muscular coat to renewed activity and hastens the expulsion of food into the intestines, thus attaining the object at which all are our efforts are aimed in the treatment of this troublesome disorder.

The use of drugs, other than for special indications, is somewhat limited in the management of dilatation of the stomach. In cases attended by marked atony of the muscular coat the use of strychnine, or nux vomica, continued over a long period of time, has given beneficial results. When severe pain or gastralgia is of frequent occurrence much benefit may be derived from the intragastric administration of the galvanic current in the manner already described. Or for this symptom sedative remedies may be resorted to, such as cannabis indica, chloral, cocaine, and morphine; good results are also said to be obtained by the use of bismuth in large doses suspended in water. When hyperacidity exists the administration of alkalies is called for.

Constipation is a symptom requiring attention, and for its relief saline and other active cathartics may be resorted to. The use of this class of remedies is not only of benefit as affording relief from this symptom, but it has been shown that their action is to excite gastric peristalsis and thus hasten the evacuation of the stomach-contents. Again, the tendency to constipation may be relieved by the employment of enemata; large rectal injections of water possess the additional advantage of allaying the excessive thirst which is often such a troublesome symptom, and, by supplying the tissues with the fluids which the dilated condition of the stomach renders slow of absorption, they increase the amount of urine voided; this excretion is often markedly diminished in gastrectasis.

The regulation of the diet is of the first importance in the management of dilatation of the stomach. The quantity of food allowed should be as limited as practicable, and fluids of all kinds are in general to be entirely cut off, or given in very small amounts. All foods that readily undergo fermentative changes are obviously to be avoided. It is evident, therefore, that all starchy foods and articles of diet con-

taining sugar are to be proscribed; fatty substances, also, which when unduly retained within the stomach undergo decomposition, are not to be partaken of. The nourishment allowed a case of gastric dilatation should consist of foods chiefly of an albuminous nature, given in the most concentrated form possible. The various preparations of peptonoids now so largely manufactured, and some of which are so valuable as nutrients, will be found serviceable in this condition. So also meat-juices, meat-powders, peptonized milk, and articles of a like nature constitute the class of nourishment upon which reliance must be placed. As the amount of food given at any one time must be strictly limited it is evident that the frequency of its administration must be adequate to the demands of the tissues. In many cases gastric alimentation must for a time cease altogether, or be reduced to a minimum; in these cases the resort to rectal feeding becomes necessary; and in any event much advantage is obtained by supplementing the gastric assimilation by nutrient rectal enemata.

CANCER OF THE STOMACH.

THE relative frequency of gastric cancer, as compared with cancer attacking other portions of the body, would seem to be conclusively demonstrated by the statistics collated by Welch from various sources and embracing the enormous number of 31,482 cases. These statistics show that cancer of the stomach occurs next in frequency to cancer of the uterus, the most common of all locations of cancer; the stomach being involved in 21.4 per cent. and the uterus in 29.5 per cent. of the cases. On the other hand the statistics of Virchow, embracing the cancerous affections occurring in Würzburg between the years 1852 and 1855, show that the stomach was involved in 34.9 per cent. of the cases, while in only 19 per cent. was the uterus attacked. Welch's cases, however, include Virchow's statistics, and the higher percentage which the latter show in favor of the stomach is counterbalanced by other series of cases in which the proportion with which these two organs are involved is practically reversed. It is only by the analysis of such a large series of cases as that brought together by Welch that conclusions which are approximately definite may be reached, as comparatively small series of cases may show with varying frequency the involvement of one or other of these organs in excess of the other.

While a common disease in this country, statistics would seem to prove that gastric cancer is rather more prevalent in Europe. Thus the statistics of New York City from 1868 to 1882 inclusive, as ana-

lyzed by Welch, show that the ratio borne by cancer of the stomach to all causes of death, at all ages, is about 0.4 per cent.; and even if only the deaths from upward of twenty years of age be taken, the ratio does not exceed 1 per cent. On the other hand the statistics of Halbertin, taken from all parts of Switzerland, show the death-rate from gastric cancer to be nearly 1.9 per cent., varying from 3 per cent. in the northern to 1 per cent. in the southern part.

The part played by sex in the predisposition to gastric cancer would seem to show, according to the statistics, that more males than females are affected. The statistics of Welch show that the ratio of males to females is about 5 to 4; or, in other words, of the 2214 cases subjected to analysis from this standpoint, 1233 occurred in males and 981 in females. In Brinton's collection of 784 cases, 440 were in males and 344 in females. From a small series of 46 cases that I have taken from the records of the Jefferson Medical College Hospital, it was found that 36 occurred in males and 10 in females. While the above figures show a greater liability of the male sex to gastric cancer, it must not be overlooked that these statistics are taken largely from hospital records, and the larger percentage of males thus shown would be susceptible of explanation from the fact that, as a general rule, these hospitals are more largely attended by males than females.

The age at which gastric cancer occurs is shown by the following table, comprising 2038 cases collected by Welch from various sources:

Age	10–20	20–30	30–40	40–50	50–60
Number of cases	2	55	271	499	620
Per cent.	0.1	2.7	13.3	24.5	30.4

Age	60–70	70–80	80–90	90–100	Over 100
Number of cases	428	140	20	2	1
Per cent.	21	6.85	1	0.1	0.05

In the small series of 46 cases from Jefferson Hospital the frequency of cancer of the stomach during the various decades is shown to be as follows: Twenty-five to thirty, 2; thirty to forty, 10; forty to fifty, 10; fifty to sixty, 18; sixty to seventy, 5; seventy to seventy-five, 1. These figures are principally interesting from the fact that even in such a small series of cases a close correspondence exists with the very large series analyzed by Welch. In both it will be seen that about three-fourths of all the cases are to be found between forty and seventy years of age, and that the decade during which the greatest number of cases occurs is between fifty and sixty years of age. Nevertheless, considering the number of those living between sixty and seventy years of age, the mortality from gastric cancer is probably as great during that period of life. At least, such a deduction

may be drawn from an analysis of statistics including a large number of cases.

Analysis of other statistics, as of those collected by Brinton and by Lebert, although in each a much smaller number of cases is included, simply gives results confirmatory of the conclusions to be drawn from the large number of cases brought together by Welch. It would seem, therefore, that the predisposing influence exercised by age to gastric cancer is conclusively set forth by this table. The occurrence of cancer of the stomach under the twentieth year of age is to be regarded as extremely rare; in the series above quoted it occurs in but 2 at this period of life. Matthieu[1] has subjected to analysis all the cases of gastric cancer occurring under thirty-four years of age, and found that the total number recorded in literature at the time of his inquiry (1884) was but 27. Of this number but 3 occurred under the twentieth year.

Pre-existing local conditions have been thought to exercise an important influence in the predisposition to the disease. That traumatism to the epigastric region plays a part of any importance in the predisposition to the affection is a view that is probably not tenable. The frequency with which such a circumstance is held responsible, especially by the patients themselves, for a subsequently developing cancer, is probably owing to coincidence, and in many of such cases the probability is that the growth had existed before the injury in a latent form, so far as symptoms are concerned, and the injury did no more than draw attention to the seat of injury.

That chronic inflammations of the gastric mucous membrane predispose to gastric cancer was a view long held, but without adequate proofs. While, of course, some instances of the disease occur in an organ already the seat of a chronic gastric catarrh, there are but few facts that can be adduced to prove that such was the cause of the growth. On the contrary, it is surprising how small is the proportion of cases of cancer of the stomach that give a history of long-continued indigestion preceding the development of the growth and the symptoms characteristic of it.

That chronic ulcers of the stomach, either open or cicatrized, predispose to the disease may be regarded as an established fact. Those ulcers of long standing with thickened and indurated edges, and in which it seems impossible for complete cicatrization to take place, are most likely to subsequently show a cancerous degeneration. Various observers, Meyer,[2] Hauser,[3] Heitler,[4] have reported undoubted in-

[1] *Du Cancer précose de l'Estomac*, Paris, 1884. [2] *Inaug. Dissert.*, Berlin, 1874.

[3] *Das chronische Magengeschwür*, Leipzig, 1883.

[4] "Entwicklung von Krebs auf Narbigen-grunde im Magen," *Wiener med. Wochenschr.*, 1883, No. 31.

stances in which the secondary development of carcinoma has taken place in the cicatrix, or in the thickened margins of a gastric ulcer. Various other influences have at times been thought to predispose to gastric cancer, but there are no facts to warrant the assumption that such conditions as depressing influences, mental worry, disappointment, anxiety, or grief can in any way affect the predisposition to the disease.

The influence of heredity in the causation of gastric cancer is a question that belongs to the consideration of cancer in general rather than to the purposes of the present article. Very great variations exist in the conclusions arrived at by different observers as to the frequency with which, in instances of cancer, a history can be obtained of other members of the family having been affected by the disease. Welch places it as high as 14 per cent., while Lebert gives 7 per cent., and Halbertin 8 per cent.

The parasitic theory of the causation of carcinoma is one against which, at the present time, the verdict of "not proven" will have to be rendered. The fact that favorable results have been obtained in the treatment of sarcoma, as well as carcinoma, from the use of the blood-serum of horses which have been treated by the coccus of erysipelas, would seem to point to the origin of this disorder as being parasitic. The conclusive proofs, however, are wanting, and we are still in the dark as to the actual origin of cancer.

Treatment.

Unfortunately the treatment of cancer of the stomach is limited to the management of symptoms and to the prolongation of the life of the patient by the use of palliative measures. We possess no drug, nor method of treatment, that in any sense can be regarded as specific or curative in action. While this is entirely true, several drugs have at various times been loudly proclaimed as possessing positive curative powers in this disease. Although this is not in any sense to be regarded as established, yet several of these remedies have at least the power of modifying the prominence of certain symptoms, of rendering the patient more comfortable, and even, I am convinced, in some cases at least, of prolonging life.

One of the most conspicuous examples of this class of drugs is to be found in condurango, a remedy that originally owed its popularity to its introduction by Friedreich of Heidelberg, in 1874, as a specific against cancer. While not acting in any way as was first claimed, it is beyond doubt that condurango is an excellent stomachic, and it acts beneficially in gastric cancer by its favorable influence upon the accompanying gastric catarrh, and in the same way as it is found to act when administered in a chronic gastric catarrh of primary origin. Condurango may be given in the form of a decoction which, according to Fried-

reich's directions, is prepared by macerating half an ounce of condurango bark with twelve ounces of water for twelve hours, and then boiling down to six ounces and straining; of this the dose is a tablespoonful three times daily. It is more usual, however, in this country to administer the fluid extract of condurango, in doses of 20 or more drops, three or four times daily.

Einhorn[1] has recommended the internal use of methyl-blue in cancer of the stomach, and states that by its employment in 8 cases of cancer affecting either the stomach or the œsophagus, a great improvement in most of the symptoms took place in 3. In one case a tumor of considerable size which had occupied the gastric region apparently became somewhat smaller after about three weeks' use of the drug. In this instance the patient continued the use of the remedy uninterruptedly for about nine months, with the result that during that time there was complete freedom from pain and an apparent arrest in the growth of the tumor. Subsequent to this, however, the symptoms in an aggravated form returned, the tumor commenced to grow, and death shortly occurred.

I have had but little experience with methyl-blue, and cannot, therefore, attest its worth; it is best administered in capsules in doses of about 3 grains twice daily. With the use of condurango my experience has been much more extensive, and I believe it to be of advantage in the treatment of the disease, not as a specific but in the manner above indicated. I am in the habit of following the advice of Ewald, and giving in conjunction with condurango hydrochloric acid, as this ingredient of the gastric juice is always absent or greatly lessened in gastric cancer.

Apart from the use of these drugs, which may be said to be given on account of their influence in modifying the course of the disease, the medical treatment of gastric cancer is purely symptomatic. Pain is present in all cases at some period of the disease; it was a symptom calling for treatment in all of the 46 cases taken from the Jefferson Hospital records. To alleviate the patient's suffering cocaine may be used, although it is of doubtful efficacy. Of much more benefit is chloral hydrate, particularly for the distress arising from the decomposition of food or from the extension of ulceration. Its effect is sedative, but in some cases, as Ewald has pointed out, its local action cannot be taken advantage of because of the predominance of its hypnotic properties. It is best given in solution, in doses of about 7 grains every two or three hours. While these drugs, as well as other milder sedatives, are of advantage in the earlier stages of the disease, sooner or later recourse must be had to opium, or one of its derivatives, to relieve the patient's sufferings. Nor need the fear of

[1] *Deutsche med. Wochenschr.*, 1891, No. 18.

instituting the opium-habit deter us from the administration of the drug in sufficient quantities to afford the required relief. Opium itself may be administered in the form of suppositories or taken internally in the form of pills, the latter being preferable, as some effect is to be expected from the local action of the drug. There are objections, however, to the use of opium that apply in a much less degree to its derivatives, morphine and codeine, especially the latter. The principal objection is that it tends to still further paralyze the already sluggish intestinal peristalsis. It is better, therefore, to administer morphine or codeine in doses sufficiently large to quiet the pain, and always if possible by the mouth, in order to secure their local analgesic effects. Belladonna, or atropine, may be added with advantage, as its action tends to counteract the constipating effect of the opium.

Vomiting occurred in 42 of the 46 Jefferson Hospital cases. The persistence of this symptom depends somewhat upon the location of the lesion. I have seen cases, notably one of diffused carcinoma at the Philadelphia Hospital, in which almost the entire gastric wall was involved in the growth, and in which vomiting was absent during the entire course of the disease. In the particular instance referred to, and this is usually the case, the orifices of the stomach were but slightly implicated. The symptom is frequently relieved by the use of opium or morphine, given internally or hypodermically. In many instances it is only necessary to administer small pieces of ice, with a dash of brandy or a few drops of chloroform; small quantities of carbonated water, iced, and frequently repeated, will also prove of use; in the same way champagne may be employed. At times I have controlled this symptom by the use of equal parts of Vichy water and milk, rendered very cold, and taken in small amounts at frequent intervals. In addition, in the way of drugs, may be tried hydrocyanic acid, creasote, carbolic acid, or chemically pure oxalate of cerium. In those instances in which the vomiting results from the stagnation of food in the stomach, especially when the lesion is pyloric in location, and the contents of the stomach have become fermented and decomposed, the best relief is afforded by lavage performed in the manner already described under the treatment of gastrectasis.

Hæmatemesis, though frequent, is not often an urgent symptom; it occurred in 33 of the Jefferson Hospital cases. By the nature of the lesion the blood-loss is rarely very great, and usually consists in the ejection of the characteristic coffee-ground material. When large, it is best controlled by the use of cold, applied locally to the epigastrium and taken internally in the form of cracked ice. In addition we rely upon rest and the administration of opium and ergot, maintaining the patient's nutrition by rectal feeding.

Constipation is to be relieved by the mild vegetable aperients, or by rectal injections, or glycerin suppositories; the salines are avoided, as they unnecessarily add to the patient's exhaustion. Diarrhœa should be controlled by opium given by the rectum as suppositories, or in the form of small enemata of starch-water and laudanum.

The *diet* in gastric cancer is to be regulated with the view of maintaining the nutrition of the patient as long as possible. The dictum of Trousseau is that, in the selection of the particular articles of food, the patient should be referred to his own experience. Bearing this in mind, the important point to be considered is that the more nourishment the patient can take and assimilate the more prolonged will be his life. Owing to the diminution in the secretion of hydrochloric acid, meat and other foods of an albuminous nature are not well borne, and the patients are found to do better upon a diet of starches and vegetables. Meats, however, that are prepared in such a way as to render them easy of digestion may be advantageously given. In this way, meat well scraped and given raw or broiled may be assimilated. Milk predigested, matzoon, koumyss, kefir, and the various peptone preparations are to be relied upon in many cases. Somatose, Leube's beef-solution, Kemmerich's peptone, Mosquera's beef-jelly, or a good beef-peptone will serve as examples of this class of foods. In addition, raw or soft-boiled eggs, the white meat of fowl, fish foods, and a small quantity of well-baked or toasted bread may be used to vary the dietary. Soups made of leguminous flour, and weak tea or coffee, are admissible in most cases. Fatty substances, on account of their liability to undergo decomposition when their stay in the stomach is prolonged, are to be prohibited. So also are those liquors in which fermentation has been incomplete, and which still contain a large proportion of fermentable substances. Foods of all descriptions are to be rendered as fine as possible, and all substances containing a large amount of dense connective tissue or that are encased in tough coverings are to be avoided. In the later periods of the disease the choice of foods becomes extremely limited, and it is then usually necessary to be governed by the previous experience of each individual case.

The employment of mechanical measures for the relief of gastric cancer is a subject more properly discussed in surgical treatises, and even their brief consideration is not called for in the limits of the present article.

GASTRIC ULCER.

A NUMBER of factors seem to influence the liability of an individual to become the subject of peptic ulcer; and while any one condition cannot as yet be said to be the positive and definite exciting cause of the affection, it is probable that it arises from one or more of several conditions. That the disease is of great frequency is conclusively proven by the extensive statistics of Welch and Brinton, both of whom agree in the statement that ulcer of the stomach, cicatrized or open, is to be found in about 5 per cent. of persons dying from all causes. While this represents the post-mortem frequency with which gastric ulcer, or the evidence of its previous existence, is found, its clinical manifestations are not met with in anything like the same degree of frequency. Welch himself calls attention to the fact that the statistics relating to cicatrices are not as trustworthy as those relating to open ulcers, as it is not always possible from the character of the cicatrix to determine positively that its original cause has been a peptic ulcer, and not a loss of substance arising in some other way. Nevertheless, the statistics relating to open ulcers alone show that they are to be found in from 1 to 2 per cent. of persons dying from all causes, a figure that is still greatly in excess of the frequency with which the disease is encountered clinically. From the figures given by Lebert[1] it would appear that gastric ulcer occurs clinically in about 6 out of every 1000 cases treated for general diseases; thus, out of 41,688 cases coming before him between the years 1853 and 1873, the clinical diagnosis of gastric ulcer was made in 252 cases.

The frequency with which gastric ulcer prevails seems to vary in different regions; for Munich it is placed by Nolte at 1.23 per cent., for Berlin the frequency is placed by Berthold at 2.7 per cent., while Griess gives 8.3 per cent. for Kiel, and Stark 13 per cent. for Copenhagen. Inasmuch as gastric ulcer is to be ascribed, in part at least, to local irritation of the gastric mucosa, the varying frequency with which the disease is encountered in various localities is to be accounted for by the variations in the mode of living and the character of the food in general partaken of in different places. Of particular interest from this standpoint have been the investigations of Von Sohlern[2] which have shown that in certain parts of the Rhön mountains and the Bavarian Alps, as well as in the greater part of Russia, gastric ulcer is rarely met with. This apparent immunity from the disease he ascribes to the fact that the inhabitants of these regions live almost exclusively upon a vegetable diet, the particular effect of which is

[1] *Krankheiten des Magens*, Tübingen, 1878, S. 196.

[2] "Der Einfluss der Ernährung auf die Entstehung des Magengeschwürs," *Berl. klin. Wochenschr.*, 1889, No. 14.

that a larger amount of the salts of potassium is added to the blood than under a mixed diet. As the red blood-cells are the chief carriers of potassium, Von Sohlern asserts that the increased quantity of this substance constantly added to the blood is to be regarded as the cause of the relative immunity from ulcer possessed by vegetarians. Upon this hypothesis he advises, as a prophylactic measure against ulcer, a diet rich in vegetable matter and the administration of potassium salts.

As to the predisposing influence exercised by sex and age, the various statistics seem to be agreed. All statistics show that the disease occurs more frequently in the female than in the male, the proportion being nearly as two to one. Welch found the proportion to be 2 males to 3 females, his analysis including 1699 cases. I have collected from the records of the Jefferson Medical College Hospital 55 cases of gastric ulcer that have been treated there during the last few years; of these, 15 occurred in the male and 40 in the female sex.

As regards age in its influence upon the development of the disease, while the affection has occasionally been met with in early childhood we may regard that period of life, up to the tenth year or a little older, as practically free from liability to the disease. Between the ages of twenty and forty gastric ulcer is most common, while its mortality is probably highest between forty and sixty years. From Welch's statistics three-fourths of all the cases are found to occur between the ages of twenty and sixty. The decade during which the largest number of cases is found is between twenty and thirty years; this is particularly true of the female sex, the larger number of males developing the disease during the subsequent decade, from thirty to forty years. Analysis of the 55 cases at Jefferson Hospital with particular reference to age shows that the disease prevailed at the various ages as follows: Ten to fifteen, 1; fifteen to twenty, 6; twenty to thirty, 24; thirty to forty, 16; forty to fifty, 4; fifty to sixty, 4. Of course such a series of cases is too small for the drawing of definite conclusions, but it is interesting for the reason that it coincides with the main features of those statistics that include a larger number of cases.

That occupation plays an important part in the predisposition to gastric ulcer is a question that admits of some doubt. Nevertheless, the prevalence of the disease among individuals following certain occupations is a subject that has excited attention since the early period of our knowledge of the disease. It is thus found that housemaids, female cooks, and needle-women show an apparent tendency to the affection. Likewise those whose occupation necessitates a more or less continuous pressure upon the epigastrium appear to be thereby predisposed to gastric ulcer; such individuals,

for instance, as shoemakers, weavers, and, because of the posture that they habitually assume, tailors. Gastric ulcer occurs in association with various other diseases, especially with menstrual disorders, chlorosis and anæmia, and the relationship, to a certain extent at least, is doubtless a causal one.

The exact etiology of gastric ulcer, however, is as yet involved in some obscurity. Efforts have been made by various investigators to elucidate the subject by experiments upon animals. Lesions of the mucous membrane of the stomach have been produced by the artificial production of emboli brought about by ligating small vessels; by causing hæmorrhages through injury to certain parts of the central nervous system; or by directly subjecting the gastric mucosa to the influence of certain chemical or other irritants. The loss of substance resulting from any of these procedures, however, does not conform to the characteristics of the gastric ulcer, the tendency of which is to spread, and to cicatrize but tardily. The investigations of Griffini and Vassale proved that the mucous membrane under these circumstances is rapidly replaced—even the true peptic glands being formed from the superficial epithelium first covering the wound. So rapidly does this healing process take place that in from ten to fifteen days not a trace of the injury will remain. From the results of these experiments it would seem that a simple loss of substance is not sufficient to cause the chronic ulcer, to produce which it appears to be agreed there must be, in addition to the local lesion, some associated influence; namely, "A disproportion must exist or be created between the secretions of the gastric glands and the nutritive blood, either synchronous with or previous to the appearance of the local lesion" (Ewald). The following experiments would seem to confirm this theory: By producing gastric hæmorrhages as the result of section of the spinal cord, and then introducing into the stomach a $\frac{1}{2}$ per cent. solution of hydrochloric acid, Koch and Ewald[1] were enabled to produce deep ulcers in the stomachs of animals. Quincke and Daettwyler[2] made the animals anæmic by venesection, and Silbermann[3] disintegrated the corpuscles and produced hæmoglobinæmia by the introduction of substances into the circulation, and in both instances the artificially produced lesions healed very gradually and presented an appearance similar to that of real ulcer. In one of Silbermann's experiments the lesion failed to heal at all, and perforation occurred. If gastric ulcer developed after all lesions of the gastric mucous membrane in which a loss of substance occurred, the disease would be even much more frequent than it is. On the con-

[1] Ewald, *Klinik*, etc., 1. Th. 3. Aufl. S. 122.

[2] Quincke u. Daettwyler, *Correspondenzbl. f. Schweizer Aerzte*, 1875, S. 101.

[3] *Deutsche med. Wochenschrift*, 1886, No. 29, S. 497.

trary, innumerable and striking instances are on record in which the gastric mucosa has suffered severe injury without a true ulcer developing. Indeed, it is almost the rule in such cases, as in the experiments upon animals above quoted, that rapid healing takes place. Nevertheless, occasionally true ulcer develops subsequently to a traumatism, as in one of the cases referred to by Welch and reported by Williams.[1] The case was that of a boy who drank some strong mineral acid, and after three or four days of suffering apparently fully recovered. Two months afterward, however, sudden death occurred from the perforation of a gastric ulcer.

The theory advanced by Virchow that there exists an important relation between diseases of the heart and blood-vessels and gastric ulcer is applicable to only a limited number of cases. Virchow held that the ulcer resulted from embolism or thrombosis of a nutrient artery supplying a certain part of the mucous membrane, and that the resulting infarct was acted upon and destroyed by the gastric juice. That this theory explains the occurrence of the disease in certain instances only is proved by the fact that gastric ulcer occurs in individuals not the subjects of cardiac disease; that the affection occurs most commonly between the twentieth and fortieth years, and therefore at a time of life when vascular lesions are not common; and the further fact that the evidences of arterial thrombosis or embolism in the vicinity of the ulcer are not to be found in many cases.

The fact that hydrochloric acid is with but few exceptions present in the gastric juice in cases of ulcer, and the further fact that it is almost always present in excess, have served as a basis for the theory that this is the most important etiological consideration in the production of the disease. That there are exceptional cases, however—and Einhorn has cited two very striking instances—in which hydrochloric acid is not only not in excess but is actually absent from the gastric juice, serves to prove that hyperacidity, though without doubt the most frequent, cannot be regarded as the only cause of gastric ulcer. Einhorn is right in concluding, therefore, that gastric ulcer is not always produced by one and the same factor.

Treatment.

The successful treatment of gastric ulcer must meet the following indications: The stomach must be placed as far as possible at complete rest; existing hyperacidity must be corrected, if necessary by special means; the state of the blood, anæmia, chlorosis, etc., must be improved; and symptoms must be relieved.

The first indication is complied with by putting the patient to bed

[1] *The Lancet*, April 9, 1842.

and by the careful regulation of the diet, or the withdrawal for a time in certain cases of all alimentation by the stomach and resort to rectal feeding. In other words the patient is put upon the rest-cure, a method of treating gastric ulcer to which Leube[1] and Von Ziemssen[2] first called particular attention, although the treatment had previously been carried out in England by W. Fox[3] and B. Forster. Under this treatment the patient is placed at rest in bed, a dietary such as will make the least demand upon the stomach is selected, and is supplemented, or replaced if necessary, by rectal alimentation; to lessen irritation and to relieve pain, the application externally of moist heat over the upper abdominal area is also added. The treatment continues for two or three weeks, and longer if necessary. The diet is to be liquid, of which milk constitutes the basis to-day as it has ever since its use was first recommended by Cruveilhier, who also gave us the first careful and systematic description of the disease. Milk may be administered alone, or its tolerance by the stomach may be rendered more ready by the addition of lime-water, strained oatmeal, or barley; or by the addition of an equal quantity of Vichy water, a method of administration to which I am particularly partial, especially when the stomach is in a very irritable state. At this period of the treatment, also, the diet may be varied by the use of one of the reliable peptone or peptonoid preparations now so readily available.

Nourishment should be administered frequently during the first week of treatment, in small amounts at a time, and should be partaken of slowly. Thus, from four to five ounces of either of the foods just mentioned may be given the patient every hour. No change should be made in the character of the food until the third week, excepting that during the second week of treatment the quantity of food at each feeding should be increased and the frequency of its administration diminished to every two hours. During the third week the diet is supplemented by the use of leguminous soups, and later by vegetables of a like character; now we may give well-boiled rice, raw or soft-boiled eggs, tapioca, farina. From these the diet gradually changes to that ordinarily partaken of, beginning with meat that has been well scraped and given at first raw, later broiled. In the subsequent daily diet of the patient it is of course important to exclude foods that place too great a tax upon the digestive powers of the stomach. The regimen prescribed by Von Ziemssen and Leube also directs the removal, at the beginning of the third week, of the moist applications that have up to this time been continuously applied to the epigastrium, usually in the form of flaxseed poultices; and it further allows the patient at this time to begin sitting up, the

[1] *Magenkrankheiten*, S. 117. [2] *Volkmann's Samml. klin. Vorträge*, No. 15.
[3] *Reynolds' System of Medicine*, vol. ii. p. 944.

length of time being increased each day, so that during the fourth week he may be allowed out of doors.

This system of rest-cure, carried out in its completeness, also includes a "Trink-Kur" in the form of hot Carlsbad water or a solution of Carlsbad salts, taken twice daily, morning and evening, the latter just before retiring. This addition, however, constitutes no very important part in the successful treatment of gastric ulcer, as the great majority of cases get along quite as well without the Carlsbad salts.

In very many cases of ulcer it is necessary to give the stomach a complete rest for a few days, maintaining nutrition by the resort to rectal alimentation. Indeed, I believe it to be a good practice in all cases presenting symptoms of a decided character to institute this method of feeding, and rest the stomach for three or four days. In cases of marked severity I have frequently in this way rested the stomach for periods varying from ten days to two weeks, this long continuance having been rendered necessary by hæmatemesis, or frequent vomiting without blood, and by excessive pain. It is usually my practice in this class of cases not abruptly to stop rectal feeding as soon as the stomach begins to take food, but so to arrange the dietary that as stomach-feeding is increased in activity rectal feeding is correspondingly diminished. In this way any sudden strain upon the stomach by the demands of digestion is avoided, a condition not unlikely to arise when the organ which has been fasting for five days or more is at once called upon to meet the necessities of nutrition. The nutritive enemata should not be over five or six ounces in quantity, and may consist of milk rendered alkaline by the addition of a small quantity of common salt, and into which one or two raw eggs may be broken and well beaten. Instead of the egg a half-ounce of peptone may be added to the milk, or the enema may consist of peptone and water instead of milk. I believe, in those cases where rectal feeding should be maintained for so long a period as five days and when we must depend upon it solely to maintain nutrition, that it is better to employ the injections more frequently than is usually deemed necessary. It is important in the treatment that the patient's strength be maintained, that not too much flesh be lost, and that the quality of the blood be rendered as high as possible, as all these conditions must have an influence in hastening healing of the ulcer. For these reasons it is my opinion that nutritive enemata should be given at least five times during the course of the day. While rectal feeding is in progress the patient's comfort is enhanced, and the quietude of the stomach not interfered with, by the occasional administration of small pieces of ice or occasional sips of Vichy water.

In cases where hyperacidity exists, and these are in the majority,

it becomes necessary to neutralize its effects. If it be true that this condition has much to do with the production of an ulcer, it is important, in order that a cure may be effected, to reduce to a minimum this causal factor. Of course this is accomplished by the rest which we impose upon the stomach and the character of the diet subsequently administered, for the neutralizing effect of milk upon acids has been well established. Nevertheless, in many cases these measures will not prove sufficient, as the continuance of pain, vomiting, and acid eructations would to a certain extent indicate; it then becomes necessary to order the systematic and frequent administration of an alkali. For this purpose no better preparation than bicarbonate of sodium can be given, alone or in combination with other alkaline salts. It is administered by Ewald in combination with rhubarb and sugar, to obtain by the former a gentle action upon the bowels, while the addition of sugar has been recommended on account of its pain-quieting qualities. Thus:

℞. Magnes. ust.,
Sodii carbonat.,
Potassii carbonat., *āā.* gr. lxxv (5.0);
Pulv. rhei, gr. cl (10.0);
Sacch. lactis, ʒvij (28.0).—M.
Sig. As much as will rest upon the point of a knife, dry on the tongue, every hour.

As soon as the patient's condition shows signs of improvement, and the gastric irritability is sufficiently allayed to allow the return to a more ordinary dietary, we must meet the indication to improve the general nutrition. The frequency with which the state of the patient's blood seems to act as the basis for the chain of events resulting in gastric ulcer must be borne in mind. In many cases of anæmia and chlorosis, as well as associated with menstrual disorders, it is not unusual to find a hyperacid state of the gastric juice, and, it matters not whether the blood-condition be the cause or the effect, its correction is demanded as early as possible.

The remedies upon which we rely to accomplish these results are iron and arsenic: iron when the condition of the blood is one of decided anæmia, arsenic when a more general effect upon the system at large is desired; the two, however, are administered in combination with decidedly advantageous results. It matters not what particular preparation of iron is used if its assimilation is secured. I am extremely partial to the pepto-mangan as prepared by Gude; I have found this preparation to possess but little disturbing effects upon the stomach and that it has but a slight tendency to cause constipation.

Ewald strongly endorses the use of the chloride of iron, as one of the most easily assimilated preparations. Arsenic is best employed in the form of arsenous acid, and should be given in increasing doses. The use of these drugs should be continued for months, the arsenic, as stated, in increasing doses, with occasional periods of rest from its use; after each interval of rest the dose to begin with should be the minimum one and then gradually increased for three or four weeks; while after this period its use should be discontinued for a few days, in the way mentioned above.

Not every case of gastric ulcer is in such circumstances that the rest-cure as above outlined can be followed out. These individuals have to be treated as "ambulatory" cases, and this is the class to which the use of bismuth and nitrate of silver is especially applicable. Bismuth has for a long time proven itself of great advantage in various gastric disorders, especially those attended with pain. In the treatment of gastric ulcer the latter-day tendency, responding to the influence of the French physicians, is to give it in very large doses suspended in water. Thus from 45 to 75 grains are administered three times daily, before meals, suspended in a wineglassful of water. Ewald advises much larger doses administered in the same manner. "Am rationellsten scheint mir die Methode der Französen, welche grosse Mengen, 10–15 Grm. in Wasser gelöst, nehmen lassen."[1] When bismuth is employed its use should be uninterrupted for two or three weeks. It is obvious that in the employment of these enormous doses care should be taken that a pure article of the drug be obtained, and especially that it be free from arsenic. This precaution is not so necessary now as it would have been formerly, as preparations of the drug free from arsenic are, at the present day, much more easy to secure.

For its supposed local effect upon the ulcer nitrate of silver has also been extensively used in the treatment of the disease, and evidence of its advantages is given by good authorities. It is best administered in solution, in doses of about gr. $\frac{1}{3}$ three or four times daily, the treatment being continued for three weeks or longer.

While under either of these forms of treatment, the patients who are not able to undergo the rest-cure are permitted to attend to their daily duties, although great care in the diet is as necessary, although not as easy to carry out, as under the rest-cure plan; the diet should therefore conform as nearly as possible to that already outlined.

The symptoms more particularly requiring treatment in gastric ulcer are pain, vomiting, and hæmatemesis, and all are of frequent occurrence during the course of the disease.

Pain of such severity as to call for special treatment was present

[1] *Klinik, etc.*, Th. 2, S. 431.

in 50 of the Jefferson Hospital cases. In many instances, perhaps the majority, the outline of treatment as already described is sufficient to allay these symptoms. Thus, pain usually succumbs to the influence of the enforced rest, to the administration of a non-irritating and neutralizing diet, or to the use of alkalies, subnitrate of bismuth, or nitrate of silver. Nevertheless, special treatment directed to the relief of pain becomes necessary, not only for the constant pain incident to gastric ulcer, but also for the attacks of gastralgia which in many instances are of such frequent occurrence. Almost as a matter of course we turn first to morphine to alleviate the patient's sufferings, the mode of administration being either by the mouth or subcutaneously. Although this is our main reliance, we must not overlook the advantages to be derived from cannabis indica, belladonna and hyoscyamus; especially from the use of the first-mentioned drug have I obtained the most satisfactory results, when given in combination with morphine or codeine.

Vomiting as a symptom seems to be associated with the gastralgic attacks, so that the treatment instituted for the relief of the latter serves the additional purpose of checking the former. For reasons already given, the most potent factor in bringing about relief from vomiting is rest and the carefully regulated dietary, as well as rectal feeding. The influence of these may be enhanced by allowing the patient to swallow small pieces of ice with a few drops of chloroform. It has been recommended that when vomiting is especially severe and intractable, lavage be performed. Unquestionably marked relief frequently follows this procedure, but it cannot be regarded as entirely free from the danger of causing hæmorrhage or perforation, and I consider myself fortunate in having been forced to its use upon only very rare occasions.

Hæmatemesis in the course of gastric ulcer requires careful management and is a symptom of frequent occurrence. The necessity for all the precautionary measures already advised in the treatment of the disease becomes increased and as much care is required in the treatment of small hæmorrhages as in those that are profuse, as the smaller blood-losses may be premonitory of the larger. It is of prime importance that absolute rest, both general and local, be enjoined. If not already in bed the patient should without delay be placed there, and recourse at once had to rectal feeding. The patient may be allowed to swallow small pieces of ice or small quantities of ice-cold fluids, and ice-cold applications should be placed upon the abdomen. If there be much vomiting or restlessness, morphine should be administered hypodermically. With the view of directly controlling the hæmorrhage, ergot or ergotine may be used subcutaneously. If the hæmorrhage be profuse and show a tendency to recur, Ewald recom-

mends the repeated washing out of the stomach with ice-cold water. Undue retching and straining usually incidental to the introduction of the stomach-tube should be guarded against by cocainizing the pharynx or by the previous injection of morphine. If, notwithstanding our efforts, the patient pass into a condition of collapse, resort must be had to the subcutaneous administration of diffusible stimulants, to stimulating rectal enemata, and the external application of heat. If the patient become exsanguined, transfusion of blood may be resorted to; or, as is at present more generally practised, and with better results, the infusion into the subcutaneous tissues of a pint or more of normal salt solution should be performed. In such cases also, in order that the blood may be retained in the great organs whose function is necessary to sustain life, a ligature may be applied around one, or several, of the extremities.

In perforation treatment has rarely been followed with any degree of success; it should be carried out along the general lines already laid down. The outlook being so unfavorable recourse has lately been had to surgical interference, and several successes have been recorded.

The treatment of ulcer as it occurs in the œsophagus and duodenum is, in general, about the same as when its location is in the stomach. In the case of duodenal ulcer, however, the lesion is more serious and more intractable to treatment than is gastric ulcer; therefore the rest-cure must be rigorously carried out, and the greatest care should be exhibited in the selection and administration of nourishment, in order that the healing of the ulcer may be effected as possible.

PERITONITIS, NON-OPERATIVE AND POST-OPERATIVE, APPENDICITIS, PARATYPHLITIC ABSCESS, AND OBSTRUCTION OF THE BOWELS.

By GEORGE RYERSON FOWLER, M. D.

PERITONITIS.

Inflammation of the peritoneum is exclusively of septic origin. With the evidence before us the existence of idiopathic peritonitis seems extremely doubtful. The disease may be due to direct infection, as, for instance, when the germ comes in contact with the peritoneum, or to indirect infection, in which case the inflammatory affection arises from the presence of certain chemical products, or toxins, which invade the serous membrane through the circulation. In some instances the source of the infection is obscure. The comparatively recent perfection of bacteriological methods of investigation has rendered the discovery of the infecting germ easy; rarely the attempt at culture gives negative results. When the effused products of the inflammation prove to be apparently sterile, the failure to isolate and cultivate the germ may be due to the fact that the latter is inhibited by some unknown cause, or that the particular micro-organisms present is of a variety impossible of cultivation by any of the known methods of culture.

For convenience of study the disease may be divided into—(1) Perforative Peritonitis; (2) Infectious Peritonitis; (3) Symptomatic Peritonitis; (4) Tubercular Peritonitis; (5) Peritonitis due to Undetermined Infections.

Perforative Peritonitis.—In this variety the infection has its origin in the intestinal canal. By far the greater number of cases of peritonitis have their origin in this manner. The lesion of the intestinal canal may involve necrosis of its walls, as in ulcerative lesions, or the germ may pass through the intestinal wall without actual loss of substance of the latter, as when, for instance, this is the subject of disease, or is the seat of circulatory disturbances.

The conditions most frequently present in perforative peritonitis in which the infection takes place from loss of substance of the intes-

tinal wall are acute appendicitis, typhoid ulceration, foreign bodies, penetrating wounds, and gangrenous conditions resulting from intestinal obstruction. In the absence of ulcerative, penetrative, and gangrenous lesions the infection may be due to conditions giving rise to enervating disturbances, such as internal strangulation, strangulated hernia, intussusception, obstructions by twists, mesenteric embolism and thrombus, and in excessive handling of the intestines during operations involving the opening of the abdominal cavity. Blows upon the abdominal surface may likewise give rise to the disease.

In these cases the germ most frequently found is the *bacterium coli communis*. The almost constant presence of this germ may be due not so much to the fact that it is alone the cause of the peritonitis, but because it is the most common and abundant infectious agent in this locality under normal conditions, constituting as it does about 95 per cent. of all the germs found in the intestinal canal; and for the further reason that this micro-organism possesses such rapid powers of reproduction that other microbes are crowded out of existence by its growth, or at all events their identification is rendered impossible.

Infectious Peritonitis.—In this variety the inflammation of the peritoneum is caused by extension of infection from pre-existing septic foci or sources of infection either within the abdominal cavity or adjacent to the peritoneum, such as the rupture of abscesses, or the extension of infectious inflammation from the genital tract. It is the variety present following imperfect asepsis in operative procedures involving exposure and contamination of the peritoneal surfaces.

In infectious peritonitis the common pus-organisms, viz. the streptococcus and staphylococci, are present. The more common sources of infection in this variety are infectious inflammatory lesions of the uterus and Fallopian tubes in the female, suppurative hepatitis, gall-bladder affections, suppurative kidney lesions, abscesses and inflammations of the abdominal wall, and, as before stated, operative infection. In the more severe of these affections the streptococcus is most frequently found, and for the reason that this is the most virulent of the pus-organisms, in the peritonitis due to this cause the inflammatory action is of a high grade, and is almost if not quite as fatal as that due to the colon bacillus. The staphylococci are also frequently found, but usually in conjunction with other organisms.

The fact that in cases where infection occurs following operative attacks upon the uterus and Fallopian tubes the resulting inflammation of the peritoneum is of a most severe and generally fatal character is due to the presence of the streptococcus, which is frequently found to be present. Although some forms of the staphylococci are occasionally found to possess a virulence almost if not quite equal to

that of the streptococcus or of the colon bacillus, as a rule the infectious inflammation following exposure to the former, or more common pus-cocci, is neither so rapid in its development and course nor so fatal in its results as that which follows streptococcus infection.

Erysipelatous infection in other and remoter portions of the body, as for instance in facial erysipelas, depending as it does upon the presence of the streptococcus, occasionally gives rise to a streptococcus infection of the peritoneum. Under these circumstances the infection undoubtedly takes place through the circulation.

Symptomatic Peritonitis.—An acute peritonitis may occur in the course of an acute or chronic disease which itself is dependent upon a specific germ. Of these pneumonia and pleurisy are the most frequent. The pneumococcus is the germ most frequently found under these circumstances. The presence of this micro-organism has been frequently demonstrated in the peritoneal cavity in fatal cases of pneumonia, although it does not seem to have always produced peritonitis. On the other hand abundant and apparently indubitable evidence has been obtained proving that the peritonitis occurring in the course of pneumonia has been due to the presence of the pneumococcus. Cases of peritonitis in which this germ has been obtained in pure culture have been recorded. In the majority of these instances of pneumococcus infection either pneumonia or pleurisy was present.

Tubercular Peritonitis.—This is most commonly secondary and due to extension of infection from the intestines, the genital organs, particularly the reproductive organs in the female, and the mesenteric and retro-peritoneal glands; or it may follow tubercular affections in the pleura and lungs. It may occasionally occur as a primary disease of the peritoneum.

The classification of Aldibert is usually followed. According to this authority the ascitic, the fibrous, and the ulcerative forms are to be distinguished. The first named, as its name implies, is accompanied by a large amount of simple, non-purulent ascitic fluid, in which the intestines float about freely, owing to the absence of strong adhesions. The process is usually a subacute or chronic one. It occurs, although rarely, as an acute miliary tuberculosis of the whole peritoneum. In the fibrous form ascites may be present, but it is not abundant. In cases unaccompanied by ascitic fluid, the so-called "dry variety," neither ascites nor adhesions are present. Large tubercles are found here and there upon the peritoneal surfaces. In still another variety of the fibrous form of tubercular peritonitis, the coils of intestine are matted together in a mass by adhesions. The fibrous form of the disease has been regarded as a stage in the process of recovery. In the ulcerative form the tubercular foci break down and tissue-necrosis is the prominent feature. In the first stage there

is no suppuration, the process being essentially a dry one. Later on suppurative changes take place, these being either isolated or encysted, in which case the different stages of the necrosis may be present in different portions of the peritoneum, or the suppurative process may be general.

Undetermined Infections.—Peritonitis may occur in the course of syphilis, rheumatism, and gonorrhœa. Here the inflammation depends upon some indefinite infection. In many of these cases the presence of a definite infecting germ has not been made out, although it may be suspected. In this form of the disease may also be included the peritonitis of the new-born, although in this class of cases it is not always possible to exclude infection arising during the separation of the umbilical cord.

In spite of the now generally received opinion that peritonitis is always of septic origin, the contention occasionally arises that a simple, general, and non-infecting peritonitis is possible, and that it does occur. Cases in which the abdomen has been opened with a successful result in the course of general sero-purulent and purulent peritonitis, and in which attempts to obtain cultures have failed, have been reported. Cases of so-called "chemical peritonitis," in which all the signs of peritonitis were present and demonstrable at the operation, but with absolutely sterile cultures, in strangulated hernia, are likewise reported. Admitting the reliability of the technique employed in the bacteriological investigation, it may still be stated that there are probably micro-organisms possessing sufficient virulence to produce the disease for which proper culture-media have not been discovered.

Symptoms and Course of Peritonitis.

The onset of peritonitis depends largely upon the virulence of the infecting agent and the rapidity of the invasion of the peritoneum. In perforative peritonitis, as well as in infectious peritonitis from the rupture of a large abscess into the cavity of the peritoneum, the rapid dissemination of the infectious material over the large serous surface gives rise to proportional symptoms of a shock, rapidly followed by general collapse. Inflammations which extend slowly from a small septic focus, on the other hand, are not attended by shock. Pain is an early symptom, which also varies, both in its severity and persistence, with the virulence of the infection and the rapidity of its extravasation. It may be absent altogether. Both pain and tenderness may be at first localized, subsequently becoming general. Nausea and vomiting are almost invariably present and follow rapidly upon the onset of the disease, the contents of the stomach being soon followed by bile, and finally, in fatal cases, by material from the small

intestine, which is ejected without apparent effort by regurgitation. Hæmorrhage from the mucous membrane may occur, in which case the vomitus is of a dark-brown color.

Symptoms of septic absorption set in early in unfavorable cases, as evidenced by a rapid rise in the pulse-rate from 120 to 160; exceptionally it may be less than 100 to the minute. The temperature observations may show this to be excessively high, unaffected, or even below the normal. The intellect generally remains unimpaired to the end. The slow development of the disease is accompanied by only moderate disturbances of pulse and temperature. Chill, as a rule, is absent.

Paralysis of peristalsis occurs early, as a rule, in extensive infection, and symptoms of acute obstruction result, with, save in exceptional cases, absence of the gurgling sounds of peristalsis. An excessive distention follows. The skin of the abdominal wall becomes tense, livid, and shining, and resonance is everywhere tympanitic. In cases of mild infection distention may be the first symptom observed. Rigidity of the abdominal wall, localized at first, afterward becoming marked and general with the spread of the inflammation, is an important symptom early in the case; it may disappear with increasing distention. Serous exudation, which finally becomes purulent if the patient survive, always occurs. In tubercular peritonitis the only early symptoms in many cases are those which indicate grave general nutritive disturbances. There are digestive disturbances, progressive emaciation, and some swelling of the abdomen, which, later on, may become extreme. In some instances there may be no pain, while in others this becomes a prominent symptom.

Diagnosis.—In typical cases the diagnosis is comparatively easy. It not unfrequently occurs, however, that many of the cardinal symptoms are absent, and in some instances these may be altogether wanting, and the diagnosis is only made post-mortem. Vomiting, early, persistent, and intractable, is diagnostic, particularly in general infection. The value of pain in diagnosis is frequently overrated and may not be sufficiently prominent to cause complaint. Vomiting, pain, and distention, following rapidly upon each other, form a striking group of symptoms, and if to these be added a brownish-colored regurgitation, the constitutional effects of sepsis, and the occurrence of obstinate constipation, the diagnosis is assured in the great majority of cases. It is nevertheless true that the vomiting may be due to other causes, the pain to efforts at peristalsis, the distention transitory and from gas, and the inability to move the bowels or effect the expulsion of flatus to the administration of opium.

The great variations observed in different cases in the beginning of an attack of peritonitis is due to the variety of micro-organisms upon

which the infection depends—these differing, in their turn, in their toxæmic and other properties—as well as to the susceptibility of the individual. Later on, however, with the advance of the disease, the symptoms become highly characteristic.

In the differential diagnosis it is of the utmost importance to distinguish between peritonitis and acute intestinal obstruction. Pain, distention, vomiting, and constipation may be present in both conditions. The vomiting, however, may be absent if the obstruction is in the large intestine. The occurrence of obstruction above the ileocæcal valve may permit of one or two movements of the bowels, and in rare cases fæcal evacuations may be obtained throughout the entire course of acute peritonitis. As a rule, however, constipation is complete in both conditions. The character of the pain is important. In acute obstruction it occurs as a severe and paroxysmal symptom, while in peritonitis it is both severe and persistent. Its primary location, in obstruction, is frequently referred to the seat of the lesion, while in peritonitis it is most often observed in the epigastrium or about the umbilicus, and becomes general later. In both conditions the pulse, as a rule, becomes accelerated, although in obstruction it may be slower than normal. In peritonitis this rarely, if ever, occurs. The temperature is not elevated in the commencement of intestinal obstruction; it may rise comparatively early in peritonitis. The onset of the attack in obstruction is generally sudden, while peritonitis, particularly in the less fulminating cases, occurs more gradually.

The differential diagnosis is particularly as between perforative peritonitis and acute obstruction, as well as in cases in which the two conditions are combined. The latter is especially striking for the reason that all cases of obstruction tend to eventuate in peritonitis, and with the early masking of the symptoms by opium nothing short of opening the abdomen, which should be done in all doubtful cases, will clear up the diagnosis. Finally, the previous history of the patient, the occurrence of former attacks of an intra-abdominal inflammatory character to account for intestinal obstruction, as well as the possibilities of appendicitis, ambulatory typhoid, suppurative diseases of the adnexa in females, and purulent collections or infectious conditions in neighboring organs, as well as statements regarding the reception of injuries, are to be taken into account.

In tubercular peritonitis the cases unaccompanied by pain, and before the occurrence of ascites and pronounced abdominal swelling, should be carefully differentiated from typhoid fever. Cases in which the disease attacks the mesentery, the lymphatic glandular structures, and the omentum, without ascites, simulate tumors of the kidney, peritoneal cancer, appendicular abscesses, intestinal obstruction, adnexitis, and even neoplasms in the abdominal wall. In the ascitic

form ovarian, mesenteric, and hepatic cysts are to be excluded. The diagnosis is most frequently made by exploratory incision. In typhoid perforation the accident may occur at any time in the course of the disease. It is most frequently observed in males, and rarely in children. Save for the coexistence of the typhoid fever, peritonitis from this cause does not differ from that resulting from other intestinal perforations.

PROGNOSIS.—The occurrence of early shock and collapse stamp the case as almost necessarily fatal from the commencement. Severe and persistent pain mark the occurrence of rapid and extensive infection of the peritoneum. Dark-brown or black, coffee-colored vomited matter is almost invariably followed by death. Even vomiting without effort or simple regurgitation is to be viewed as a bad omen. Death may take place from early and rapid septic absorption. A rapid rise of the pulse to 120, 140, and 160 is significant of an early fatal termination. High temperature is always an unfavorable sign, although the reverse does not hold true. Very slight hope of recovery can be entertained when the paralysis of peristalsis is complete. Lividity of the skin and also a general "leakage" from the cutaneous surface, are most ominous signs, indicative of a profound sepsis. The character of the pulse, however, indicates the patient's condition with far greater certainty than any other one symptom. If it gradually and persistently increases in frequency and assumes either a gaseous or thready feel, an unfavorable prognosis must be given.

On the other hand, if the tenderness and rigidity remain localized, the prognosis is more favorable. The fact that bowel movements can be obtained suggests that the infection is less virulent in character, and hence the outlook better. In favorable cases the vomiting ceases, the pulse-rate becomes slower, and the temperature lessens, until convalescence is established.

Tubercular peritonitis gives the same comparatively unfavorable prognosis as tubercular lesions elsewhere, when treated medically. The outlook is better in cases submitted to surgical operation, about four-fifths recovering. In the non-ascitic form the disease has reached a stage in which it is progressing toward spontaneous cure.

TREATMENT.

In the medical treatment of peritonitis the choice of two methods is open to the practitioner. Before the present views of its etiology were entertained it was considered of the greatest importance to restrain active peristalsis, inasmuch as this latter was believed to favor the spread of the inflammation. In addition to this the pain was relieved and, in some instances, the vomiting kept under control. At the present time the opponents of the opium method of treatment

claim, and with reason, that opium as formerly employed increases the distention, and prevents the absorption of exudates and the elimination of ptomaïnes.

With our present knowledge of the septic origin of peritonitis, and the recognition of the fact that the chief danger in the disease consists in the absorption of the toxic products of the septic processes rather than in the spread of the inflammation, measures to provide for an elimination of these products through the intestinal canal form the most rational therapeutic indication. In providing for free catharsis distention is likewise relieved and absorption of peritoneal exudates favored. The method of intestinal drainage, as it is called, has been the means of saving many lives when instituted early, and is now considered the most rational and efficient of the medical means at our command, particularly when employed early in the disease, before vomiting has become persistent and intractable. Under these circumstances the distention is relieved and the peritoneum "dried out," as it were, by the endosmotic processes which follow free catharsis, and the serous effusion, which forms a favorable culture-medium for the propagation of germ life, removed. Later on in the case, when general peritonitis is fully developed, it is doubtful if cathartics exercise a favorable influence upon the course of the disease. Indeed, it is generally useless to attempt to procure free evacuations by their use, since they frequently fail to act, and only increase the nausea and vomiting and the discomfort of the patient. In the event of the existence of a perforation of the intestinal wall a positive contra-indication to their use exists, for the reason that they increase the extravasation of liquid fæcal matter into the peritoneal cavity.

Thus it will be seen that both of these methods of treatment find a place in the resources of the practitioner. That by catharsis should be first instituted, with the hope of cutting short the disease in its incipiency by promptly relieving the distention and averting paralysis of peristalsis and draining the peritoneal cavity of whatever serous exudate may be present, and thus getting rid of what has been shown by laboratory experiments and clinical experience to be a source of danger in the presence of micro-organisms, namely, a favorable culture-medium for the growth of the germs.

When the vomiting has become uncontrollable and the distention extreme it is useless to attempt to influence the onward progress of the disease by these means. The patient will reject the cathartic agent almost immediately, and even if it should be retained, the muscular apparatus of the intestinal canal, no longer under the control of its nerve-supply, will refuse to respond in a normal manner.

The employment of opium now finds its legitimate place in the case. The object sought is to carry the patient along with the view

of protecting his nervous system from the effects of the intense restlessness which is generally present, and incidentally to relieve the pain and control the vomiting. This is accomplished by opium better than by any other drug. As long as there is any hope for the patient the remedy is to be given in small doses frequently repeated, until vomiting is under control or at all events markedly abated. Only too often, however, the general condition of the patient stamps the case as so indubitably hopeless, and the suffering becomes so extreme, that the practitioner seeks refuge in larger doses of opium with the sole view of euthanasia.

The class of cathartics selected, when this method of treatment is applicable to the case in hand, is that known as salines. The one most generally acceptable and efficacious is the sulphate of magnesium, or Epsom salts. This should be given in half-ounce doses, either as a saturated solution, or, what I generally prefer, in just sufficient Vichy to effect the solution of the salt. This may be followed later on, if free catharsis is not obtained, by drachm doses given hourly until either a decided response to its action results, or it becomes evident by the increase in the nausea and vomiting that it is useless longer to expect it to act. Under circumstances of general infection, when only constant regurgitation of the contents of the small intestine follow its use, it should be abandoned and calomel substituted in $\frac{1}{5}$-grain doses repeated hourly. This will sometimes produce free catharsis without vomiting, and occasionally exercises a soothing effect upon the stomach itself. The action of these may be supplemented by enemata.

When the indications are such as to impel the attendant to resort to the opium treatment, the hypodermic use of morphine should be employed whenever practicable: $\frac{1}{12}$-grain doses given at intervals of from two to three hours act as a stimulant to the nervous system and are sometimes followed by a cessation or diminution of the vomiting, and occasionally by an improvement in the general symptoms.

There are certain conditions of peritoneal irritation following abdominal section in which opium becomes of the greatest service. The pain which this condition induces robs the patient of sleep and may bring about symptoms of exhaustion. Hence sufficiently large doses of the drug should be given to allay pain and secure comfortable sleep, as well as bring the vomiting resulting from the use of ether, which is sometimes a very distressing symptom, under control. One or two $\frac{1}{6}$-grain doses will usually suffice to fulfil these indications.

In the treatment of post-operative peritonitis much judgment may be displayed by the alert practitioner. With the first evidence of infection, or the commencement of distention, and before the vomiting becomes a prominent symptom, a dose of Epsom salts should be given

and efforts made to facilitate the action of the latter, as well as to relieve the threatened tympanites, by the use of enemata.

The employment of surgical measures of relief sometimes becomes a question of grave importance. It is extremely difficult to state the indications for operative interference, even if the surgeon see the case early, which, as a rule, he does not. To institute an abdominal section early is to run the risk of encountering a simple functional disturbance, and hence to have operated unnecessarily. On the other hand, with the indubitable evidences of an acute general peritonitis before him the surgeon is frequently confronted with the probability, if he interferes, of taking away the patient's only, although slight, chance of recovery. The grave prognosis that must always be stated, whatever course is pursued, will always prevent the conscientious surgeon from urging operation, and when the responsibility of deciding is thrust upon him he will be likely to follow the results of his own experience in this class of cases, without the aid of the opinion of others. If this experience has been large he will recall how many times he has operated in similar cases, and perhaps has never succeeded in saving life; on the contrary, he will feel that death has been only hastened. Thus, with very little encouragement to undertake the task of opening the abdomen, he will generally decide the question in the negative in the great majority of cases of peritonitis as they pass into his hands from the medical practitioner.

When, however, a recognized focus of infection is present as the starting-point of a peritonitis that has not yet become general, as in cases of appendicitis, suppurative adenitis, suppurative cholecystitis, gunshot injuries and penetrating stab-wounds, as well as traumatisms infected from the direction of the urinary tract, and even in typhoid and duodenal ulcerative perforations and in ruptured abscesses, there can be no question as to his duty, if called before general infection of the peritoneum is at hand: he should open the abdomen promptly, and treat the conditions found upon surgical principles. But unfortunately, even when the spreading infection is due to these causes, valuable time has been lost by inefficient medical treatment, and surgical aid is invoked only when the time has passed for its successful employment.

Besides the causative lesions above mentioned, there are others which demand surgical treatment, in addition to the benefits to be derived from opening the abdomen and draining the peritoneal cavity. These include intussusception, twists, internal strangulations from bands, and mesenteric thrombosis and embolisms. In all of these there is usually a period of time which elapses between the commencement of the symptoms and the supervention of a general peritonitis, as well as the presence of characteristic symptoms, that

will permit of successful surgical interference. Although a strict anatomical diagnosis is not always possible, nor yet the differentiation between a commencing peritoneal infection and a mechanical lesion, still the argument in favor of immediate operation is cogent and the indications are clear. In an acute abdominal condition in which these questions alone remain to be settled, exploratory incision is justified, and frequently demanded, if the case be seen sufficiently early to warrant the undertaking.

The general measures of treatment applicable to tubercular lesions elsewhere should be taken advantage of in tubercular peritonitis. A nutritious diet, tonics, and change of air constitute the palliative treatment. Aspiration of the ascitic fluid should give place to free incision and drainage, preferably by gauze and wicking, which is dispensed with in a few days. In the simple ascitic form this should be done early. When the disease exists in an acute miliary form operative interference is inadvisable. There is no advantage to be gained by flushing the peritoneal cavity with water or chemical solutions. In this form (the ascitic) relapses occur in about 10 per cent. of the cases operated upon. In the non-ascitic form exploratory incision may reveal localized collections the evacuation of which may hasten the cure. In cases in which numerous pus-collections are present no permanent improvement is likely to follow the breaking down of these, since probably many are not within reach, and great danger is invited by the manipulations necessary to effect this. Isolated instances of improvement following removal of local and defined tubercular mesenteric and retro-peritoneal lymph-glands are reported (Richardson). Intestinal obstruction dependent upon tubercular infiltration of the bowel-wall should receive the same treatment as that due to cancer. The mortality following incision in the ascitic form of the disease is trifling. The rationale of the method of cure is not known.

In typhoid perforation with general extravasation surgical aid should be invoked early. Perforations from one coil of intestine to another, and even slight extravasations, probably pass unrecognized frequently. With abundant and rapid fæcal extravasation, in the absence of early and efficient operative interference, death occurs unexceptionally.

Three facts should be borne in mind in connection with the operative treatment of peritonitis occurring in the course of typhoid fever: 1. The peritonitis may be due to causes other than typhoid perforation, such as acute intestinal obstruction, softened infarcts of the spleen, softened glands, abscesses of the bladder-wall, abscesses of gall-bladder of ovarian and hepatic origin, rupture of the spleen, and to extension of inflammations from the adnexa and endometrium (Fitz). 2. More than one perforation may be present in typhoid ulceration.

3. Indubitable evidences of peritonitis may be found with no discoverable local lesion present to account for the inflammation.

APPENDICITIS.

Inflammation of the vermiform appendix, until recently clinically associated with typhlitis, perityphlitis, and paratyphlitic abscess, is now known to be a distinct affection. The large majority of cases formerly placed to the credit of the above-named comparatively minor affections are now believed to have been instances of appendical lesions.

At least half of the cases of appendicitis occur in persons under twenty-five years of age; 80 per cent. occur in males, as against 20 per cent. in females. Its occurrence as the result of traumatism, if we except the presence of fæcal matter which may enter the appendix in a semi-fluid state, afterward becoming hardened into coproliths, and produce minute excoriations and abrasions, thus leading to infection of its walls, is rare. The supposed seeds of certain fruits which have been found in the appendix were probably, in the large majority of cases, masses of fæcal matter which had become moulded into shapes resembling lemon-seeds, cherry-pits, etc., in the lumen of the organ.

Occasionally, however, this same fæcal matter has incorporated in it strawberry or raspberry seeds which give a roughened exterior to the mass when drying, and in this manner the latter may assume the rôle of a foreign body. In addition to this a genuine enterolith, made up of calcareous matter and having its origin in the intestine or in the appendix itself may be found in the cavity of the organ and be viewed as bearing an etiological relation to the disease as occurring in the individual case. But one such instance has fallen under my observation.

In the same category may be included cases in which a gall-stone has passed safely through the ductus communis choledochus and along almost the entire length of the intestinal canal, only to be finally arrested at the appendiculo-cæcal orifice, and perhaps find its way into the initial portion of the appendix, owing to a more or less funnel-shaped form of the organ the result of a persistence of the fœtal type of the latter.

In seeking for a plausible reason for the ease with which inflammatory conditions may be set up in the appendix vermiformis, due consideration is to be given to the fact that this organ belongs to the class of vestigial organs, or those whose function has passed away, and the vitality of which have become thereby greatly lessened in the course of those changes in structure which precede their final

disappearance altogether. The organ in question is made up largely of lymphoid tissue, the chief characteristic of which is the absence of that high degree of vital resistance which is present in the tissues of organs with well-marked and important functions. Bearing this fact in mind it is not difficult to comprehend how a foreign body, or even dried fæcal matter, may easily produce slight abrasions of the surface of the mucous membrane lining the organ and thus initiate the series of nutritive changes which may give rise to infection, followed by either gangrene and perforation, or suppuration within peritoneal adhesions, and appendicular abscess.

In the majority of cases, therefore, no foreign body is found, if this term be limited to those bodies which are foreign in the strictest meaning of the term. Fæcal matter cannot be considered as belonging to this class, for the reason that it probably finds its way into the appendix and is forced out again by the contraction of its muscular tissues. It is sometimes found to be present when the appendix is removed in a healthy condition in the course of abdominal section for conditions not connected with this organ, and during post-mortem examinations. On the other hand, in at least 50 per cent. of cases of appendicitis the appendix is found to be entirely free from any suspicion of fæcal matter. Further, the intensity of the inflammation bears no relation to the presence or absence of fæcal matter, although it is probably true that perforation of the appendix and direct infection of neighboring structures takes place rather earlier in cases in which these fæcal masses are found. The ulcerative process which precedes the final escape of the contents of the appendix in cases of perforative appendicitis is probably due primarily to direct pressure from the desiccated fæcal mass, this being increased by the expulsive efforts on the part of the organ to rid itself of the irritating material.

So far, then, as causes of appendicitis operating primarily from within are concerned, these may be considered to be (1) foreign bodies, which although of comparative rare occurrence, are nevertheless to be considered as etiological factors in the production of the disease; and (2) fæcal matter the watery constituents of which have become absorbed, thus converting a soft, semi-fluid or pultaceous mass into what becomes to all intents and purposes a foreign body.

In addition to these, due consideration must be given to infectious agents which act from within the tube and which find their way into the latter from the intestinal canal in connection with the contents of the latter. These, however, act secondarily, since the mucous membrane of the appendix, like that of the intestinal canal itself, is capable of resisting irritative effects resulting from the presence of micro-organisms under normal conditions. Nutritive disturbances, however, from whatever cause, are capable of initiating such changes

in the mucosa as to be rapidly followed by infection of the latter as well as the connective-tissue layer immediately underlying the mucous membrane. The course of the inflammatory process which follows will depend upon the virulence of the infectious agents on the one hand, and the extent of the lessened vital resistance of the organ itself upon the other.

Attention has already been called to the fact that the organ possesses but slight inherent vital resistance as compared with organs endowed with a definite function. With this characteristic handicapping its struggle for existence to start with, it is not to be wondered at that the slightest abrasion of its mucous membrane should become the starting-point for rapidly destructive processes which may place the patient beyond human aid in a few hours.

Of no less importance are those causes which, acting from the peritoneal side of the organ, serve as a starting-point for the disease. In the great majority of cases of appendicitis coming under observation it will be found that the organ possesses a true mesentery, and hence, although covered by a peritoneal investment, is just as much an intra-peritoneal organ as the other abdominal viscera. Its mesenteric attachments, however, are such as to permit more or less free movements of the organ within the peritoneal cavity. The effect of this is to favor changes in position of the appendix. Further, certain anatomical peculiarities of the meso-appendix exist which permit of changes in shape as well as position of the organ. These consist of irregularities as regards the length of different portions of the two serous layers which make up the mesenteric structure. As a result of these irregularities the organ may present an undulating outline rather than a straight hollow tube, or a coiled or corkscrew-shaped appearance, or it may be found to be actually twisted upon itself, the mesentery being attached to the organ at several points of the circumference of the latter as if following a coarse-pitched screw instead of in a straight line. Changes in both position and shape of the appendix may result in complete angulation at any point between its base and its tip. If these changes occur to an extent sufficient to interfere with its blood-supply, in its already and natural devitalized state, necrotic changes occur rapidly. If these necrotic changes take place upon the free surface of the mucosa, infectious processes are added to complete the work of destruction. Further, with neither angulations nor twists, position alone may act primarily to bring about an attack of the disease. This is true particularly when the organ, pointing directly upward, lies between the outer side of the colon and the lateral abdominal wall. Thus located it is subjected to pressure, and the latter, in the case of an overloaded large intestine, may be sufficient to interfere with its blood-supply and give rise to conditions leading

to the development of the disease precisely as in the case of angulation, namely, the occurrence of necrotic areas, infection, and inflammatory changes of a rapidly destructive character. Finally, the occurrence of neural as well as vascular disturbances (endarteritis obliterans, Van Cott) is to be mentioned.

The infecting micro-organism most frequently found is the *bacillus coli communis*. This micro-organism exists constantly in the lumen of the appendix and also in the exudate in the peritonitis accompanying inflammation of that organ. Other bacteria, such as the *bacillus pyogenes fœtidus*, the *diplococcus lanceolatus*, and the common cocci of suppuration, are occasionally found.

Symptoms and Course of Appendicitis.

In the great majority of cases an attack of appendicitis is characterized at its onset by the occurrence of acute abdominal pain, such as is usually experienced in an attack of ordinary intestinal colic. The similarity of the onset of the latter affection and appendicitis should always place the practitioner on his guard, and the occurrence of sharp colicky pains serve to direct his attention to the vermiform appendix. The additional fact that the pain is first referred, in a large proportion of cases, to the epigastric or peri-umbilical region, and further, the occurrence of vomiting early in the case and the frequent absence of fever at this stage, serve in even greater degree to mislead the medical attendant.

With the advance of the disease pain is referred to the right iliac region, and tenderness is found to exist at this point. This tenderness is quite localized at first, and is found most frequently best marked upon the outer edge of the rectus muscle, and slightly above the level of the transverse line extending from the anterior superior spinous process of one to that of the opposite side. It may, however, be found below this line and nearer to Poupart's ligament. In cases of congenital abnormality of location of the cæcum the point of maximum tenderness will be elsewhere. Marked tenderness in the loin may be found in cases in which the retro-peritoneal connective tissue is involved.

The vomiting is not frequently persistent during the initial stage of the disease, and usually ceases with the evacuation of the stomach contents, unless the occurrence of septic general peritonits causes its return. Nausea alone, in some instances, is complained of.

Rigidity of the right rectus muscle is a marked feature in the majority of cases. This muscular rigidity becomes general in cases of extensive septic peritonitis. The right side of the abdomen may have a bulging appearance due to distention of coils of intestine in the immediate neighborhood of the inflamed appendix.

The temperature and pulse vary in different cases, although they do not by any means bear a constant relation to the gravity of the attack. There may be an almost normal temperature and pulse-rate, and yet ulceration, perforation, and septic peritonitis impending.

Fever may make its appearance as early as the second day, but as a rule it is delayed beyond the third. The mass of adhesions constituting the lesion may become the site of a suppurative process from perforation of the appendix into the adhesions, or infection of these may occur from bacterial migration. This constitutes the so-called appendicular abscess. Sero-purulent collections may occur in addition, beyond the immediate area of the appendix, and even at remote points, from infection through the lymph-channels.

In addition to the clinical picture presented by typical cases, there may occur cases of a subacute character. The practitioner should be on the watch for the sudden onset of violent symptoms in this class. Cases apparently of a mild type, and supposed to be only of a catarrhal character, may terminate suddenly and fatally from perforative peritonitis, and cases with alarming symptoms may go on to a favorable termination.

With apparent recovery without removal of the appendix the patient may suffer from relapses during the persistence of what is really a chronic relapsing form of the disease. Or, complete recovery may take place, but the patient be subjected to recurrences of the affection.

Diagnosis.—The cardinal symptom of sudden onset, acute abdominal pain referred to the general region of the abdomen rather than to the site of the vermiform appendix, at which place it may appear later on, vomiting, tenderness in the right iliac fossa, and comparative rigidity of the lower portion of the right rectus muscle are the distinguishing features of typical cases. The disease must be carefully differentiated from nephritic colic, cholecystitis, inflammatory diseases of the adnexa in the female, and some of the forms of intestinal obstruction. There is greater danger of overlooking appendicitis than of diagnosing one of these as appendicitis. Stercoral typhlitis is a rare affection compared with appendicitis, and, besides, it lacks the features of acute attack without preceding symptoms. In paratyphlitic abscess operative measures will be required, and it may be impossible to make a diagnosis beforehand. In perforative typhlitis, either from ulceration or foreign body, operative interference will be just as urgently demanded as in appendicitis.

Treatment.

While the medical attendant is generally first summoned to a patient suffering from appendicitis, the case should be viewed as one

most likely to become surgical in character at short notice. Hence the responsibility of the treatment should be shared both by the physician and the surgeon. If the symptoms denote a mild type of the disease the careful use of salines may be permitted in the very commencement. The use of opium is to be avoided if possible prior to making the diagnosis, and even thereafter as much as possible, for the reason that the course of the disease may be thereby masked, the patient seemingly improving under its use while symptoms of the gravest character are simply prevented from announcing, by their presence, the real condition. The patient may present a general appearance of well-being during which a sudden increase of pain, followed by distention of the abdomen, accompanied or followed by a rapid pulse and some rise of temperature, announce the occurrence of septic peritonitis. It should also be borne in mind that an exceptionally virulent infection may produce septic peritonitis with neither primary perforation of the appendix into the peritoneal cavity nor rupture of an abscess-cavity. Under these circumstances delay in operative interference will result in disaster, and even operation may fail to save the patient.

The indications for operative interference during an attack of appendicitis, save under the exceptional circumstances to be dwelt upon later on may be summed up as follows: As soon as a positive diagnosis of progressive appendicitis is assured, the abdomen should be opened and the appendix removed. If opium has been injudiciously administered and doubt thereby cast upon the progressive character of the case in hand, it is better to err upon the side of safety and remove the appendix. The conditions present are usually beyond the reach of remedial remedies or the power of nature to control. On the other hand, with moderately skilful surgical aid at hand and strict attention to aseptic details, both preliminary to and in the course of the operation, the latter entails less risk to life than that which is involved in even a mild attack of appendicitis which remains stationary at the end of twenty-four hours, with all the possibilities of lymphangitis, infection of the peritoneal cavity, retained muco-pus within the tube and rupture of the latter into an unprotected peritoneal cavity, or ulceration and perforation either from the presence of so-called coproliths or inspissated fæcal matter imprisoned within the cavity of the appendix, or from gangrenous conditions alone.

Many difficulties are encountered in attempting to formulate a definite rule for action in the operative treatment of appendicitis. While it is true that to operate too early may be to operate unnecessarily, it is equally true that this is preferable to operating too late and hence unsuccessfully. The fact that operative procedures are gen-

erally quite safely performed where a distinctly outlined tumor is present, providing the wall of the encapsulated abscess is not disturbed in the manipulation, has led some authorities to adopt this period of the disease as the stage of election. Under these circumstances, however, the surgeon will not be able to perform a complete operation, but must content himself with simply opening and emptying an abscess-cavity, the appendix itself being permitted to remain to give rise to subsequent attacks, one of which may prove fatal before the formation of an abscess. On the other hand, it is advocated to operate as soon as the diagnosis of appendicitis has been made, whatever its grade of severity. Between these extreme views held by those who favor operative measures a middle course is usually available. A case demanding operation within twenty-four hours from the beginning of the attack is exceptional. On the other hand, a case which is not well on the road to recovery at the end of the first day of the disease may be deemed progressive in character and should be made the subject of operative interference. This, however, must not be regarded as a hard and fast rule, and the surgeon should not limit himself to the period mentioned. Cases occasionally occur which present unusually severe symptoms within twenty-four hours, such as persistent high temperature and a succession of rigors, conjoined with exquisite tenderness in the right iliac fossa and the characteristic facial expression of a grave intra-peritoneal condition. Here the surgeon should not hesitate to give the patient the benefit of an early and radical operation.[1]

Where the aid of the surgeon is not sought until the third, fourth, or fifth day of the attack, the question as to whether or not the operative procedure may be contraindicated by the impossibility of removing the appendix without breaking down the adhesions which serve as a barrier between the original focus of infection and the general cavity of the peritoneum is frequently encountered by those engaged in this class of work. As Richardson of Boston has very tersely stated it, the surgeon may be confronted by conditions which stamp the case as one too late for the early operation, and too early for a safe late operation. This question must be decided upon the basis of the experience of the operator, as well as the means at hand in the shape of skilled assistance and other requisites to meet all emergencies as they arise. With these conditions fulfilled the operation at this the period of localized peritonitis—even to the extent of removing the appendix—is

[1] The fact should not be lost sight of that the causes which lead to the development of the symptoms may be in operation for one or more days before the latter manifest themselves; the diseased process in its early stages (such for instance as the pathological changes in the vessels of the meso-appendix known as endarteritis obliterans) being well under way before the characteristic colicky cramping pains and vomiting occur.

both safe and advisable. In their absence the operator would be justified in permitting further time to elapse, in the hope that the adhesive barriers which have been thrown out will become still stronger, and hence the dangers of peritoneal infection lessened. This, however, involves the absolute abandoning of all hope of removing the appendix, since in the attempt to accomplish this it will be almost impossible to avoid breaking down some of the adhesions. If, however, any portion of the appendix presents itself in the appendicular abscess-cavity it will be safe to ligate and excise this. Whether all or a portion of the organ is to be permitted to remain, however, is a question that must be decided in the patient's own immediate interest, the basis of such decision, as before stated, being the operator's experience and the facilities at hand for a safe carrying out of the complete operative procedure.

With the complete development of peritonitis operative measures may still be instituted. The chances of recovery, under these circumstances are relatively small. With infection of the effused serum following peritonitis the case offers only just sufficiently encouraging results to warrant the surgeon in giving the patient the benefit of a late interference. With the occurrence of general suppurative peritonitis the case is almost necessarily hopeless ; with the lapse of time following general peritonitis the chances of recovery progressively diminish. In cases in which the septic peritonitis is due to rupture of one or more of the minute embolic abscesses which sometimes form in the wall of the appendix in the course of a suppurative inflammation of the walls of the organ, operation may still be undertaken provided the serous effusion be not large and the symptoms of septicæmia be absent. On the other hand, if the entire contents of an abscess-cavity, or of an intra-peritoneal encysted effusion has escaped into the cavity of the peritoneum from rupture of adhesion, the surgeon will be confronted by an almost hopeless condition of affairs. In such cases it is advised by some to flush out the peritoneal cavity with sterilized water, or with an artificial plasma in order to rid the patient of the source of general infection which almost necessarily comes on under such circumstances. The condition of the patient is usually such as to leave the operator the only choice of simply cleansing the portion of the peritoneal cavity readily within reach. Sterilized water alone is irritating to the peritoneum, and the artificial plasmas recommended cannot all be recovered after filling the peritoneal cavity with the same. That which remains behind forms an excellent culture-medium for further propagation of the infectious agents which must almost necessarily be left behind.

Dawbarn's experiments show conclusively the impossibility of removing all of the infected serum or the irrigating fluid introduced.

This observer filled the peritoneal cavity of the cadaver with milk. He then flushed the cavity repeatedly, using every endeavor to work the flushing fluid thoroughly into every portion. After removing as much of the fluid as possible it was still found, upon examination, that considerable portions of the milky fluid remained in remote portions of the cavity.

In those instances in which a purulent collection has taken place in the post-peritoneal connective tissue, being bounded anteriorly by the transversalis fascia and posteriorly by the iliac fascia, the abscess-cavity may be reached by a horizontal or an oblique incision placed to the outer side of the epigastric artery. By carrying the incision through the skin, superficial fascia, aponeurosis of the external oblique, the transversalis muscle, and transversalis fascia the focus of suppuration can be reached without incising the peritoneum.

In cases in which the suppurative process points posteriorly (lumbar phlegmon) the incision may be made in the lumbar region, the area of suppuration being freely incised and access afforded to the deepest point. It will rarely be necessary or desirable to drain localized sero-purulent collections through the rectum or vagina. The difficulties experienced when either of these routes is chosen introduce dangers into the case which far outweigh those following the adoption of the intra-peritoneal route in competent surgical hands. I can readily understand, however, the choice of one or the other of these by one unaccustomed to abdominal operations and hence unfamiliar with the technique necessary to prevent infection of the general peritoneal cavity. Rarely, however, will such an operation be the one of choice at the hands of a skilled abdominal surgeon, and then only under circumstances where a fluctuating tumor can be plainly made out from the direction of one of the cavities mentioned, and in which it is sufficiently certain that the intervening structures are so matted together by the inflammatory process as to afford a reasonable guarantee against connective-tissue extravasation and infection by means of the contents of the abscess. In other words, unless the suppurative focus or abscess is clearly pointing in one or another of the directions mentioned, drainage by either of these routes is difficult to accomplish, unsatisfactory in its results, and hence not to be chosen.

The after-treatment of cases of appendicitis which have been subjected to operative interference is sometimes, from force of circumstances, left in the hands of the medical attendant. In simple uncomplicated cases the wound requires no attention for the first five or six days. After that the dressings are removed and replaced by fresh ones. In order to avoid the presence of serious effusion in the peritoneal cavity, which even a small amount of handling of the

abdominal contents induces, the patient is deprived of fluids for the first twelve to eighteen hours, the lips, however, being kept constantly moistened by a piece of gauze dipped in water. The effect of this deprivation is to compel the peritoneal absorbents to take up whatever serum is present in the peritoneal cavity, thereby preventing it from becoming a culture-medium for the propagation of whatever micro-organisms may have found their way therein either before or during the operation. This is the surest method of preventing septic peritonitis with which I am familiar.

Vomiting may take place to an extent requiring the use of special remedies for its relief. If this occurs soon after the operation lavage should be practised with the view of getting rid of the mucus charged with ether which has passed into the stomach during the operation. Later on, the symptom is to be treated with $\frac{1}{4}$-grain doses of muriate of cocaine every one or two hours, counter-irritation to the epigastrium (thermo-cautery), or an occasional teaspoonful of plain hot strong coffee.

Abdominal distention is always a symptom which arouses anxiety. When this is accompanied with epigastric distress it may be relieved by lavage. Large quantities of gas will sometimes be thus expelled. The rectal tube should be passed frequently, and this supplemented by an enema containing milk of asafœtida or turpentine. The addition of glycerin and sulphate of magnesium will sometimes bring away some fæcal matter as well as gas and give marked relief. Where great abdominal distress accompanies the distention the practitioner should be on his guard against paresis or paralysis of peristalsis. Under these circumstances the use of opium should be carefully avoided, and reliance placed upon attempts to relieve the cause of the distress, *i. e.* the presence of gas in the intestines, by enemata. The favorite enema used in my hospital service consists of sulphate of magnesium, half an ounce; glycerin, one ounce; turpentine, one drachm; dried and powdered ox-gall, one drachm; hot water, a sufficient quantity to make six ounces.

If the intestinal canal is found to be responsive to its normal nerve influence, as evinced by the passage of gas *per rectum*, the bowels should be moved after the lapse of forty-eight hours following the operation. A tenth of a grain of calomel should be given every half-hour until ten doses have been taken, and this followed by a half-ounce dose of sulphate of magnesium. If this is not efficient at the end of four hours, drachm doses of sulphate of magnesium should be administered every half-hour, supplemented by enemata, until the desired result is obtained.

Where there is some anxiety concerning the state of the bowels, or reason to fear the occurrence of intestinal paresis or paralysis of peri-

stalsis, attempts to move the bowels by means of the enemata alluded to should be made at the end of twenty-four hours. With the free expulsion of gas *per rectum* anxiety concerning the final outcome of the case is greatly lessened, and with a free movement of the bowels the patient is almost absolutely safe from immediately threatening intra-abdominal complications.

The first nourishment given should be milk diluted with equal parts of water. This is to be given in teaspoonful doses every quarter of an hour until four or five doses have been taken. If no gastric symptoms appear, the water is omitted, the time lengthened to every half-hour, and the quantity doubled at each succeeding dose until full milk diet is reached (half a pint every two hours), or as near to this amount as the patient will take.

If the wound has been infected during the operation and suppuration takes place, this should be treated upon general surgical principles. Stitch-abscess should be opened up, freely curetted, and packed with antiseptic gauze.

The sutures should be removed at the end of ten days, and the patient allowed to sit up in a fortnight, in uncomplicated cases. In suppurating cases the period of convalescence will be necessarily prolonged, and weakened abdominal walls and the fear of ventral hernia compel the patient to remain in the recumbent position for three weeks or longer.

Gauze-packing or wick-drainage must be left undisturbed for at least four days, or until the infected area has been well walled off beyond the drains. Wicking may be removed strand by strand, thus permitting the cavity which it occupies to gradually collapse.

The surgeon will sometimes be compelled to content himself with simply evacuating a pus-cavity or an encysted intra-peritoneal sero-purulent collection. While this will be rarely necessary in the practice of those familiar with abdominal work, yet even with such the best interests will be served by avoiding breaking down adhesive barriers. As soon as the immediately threatening local septic conditions have subsided, if the patient's consent can be gained, the appendix may be sought for and removed, the edges of the wound freshened, and an attempt made to obtain primary union of the latter. This is to be preferred to waiting until the wound has entirely healed by granulation, and reopening the abdomen.

Grave complications following the operation when performed early in the attack, or in the intervals between the attacks, are comparatively rare. On the other hand, these are always to be apprehended when operative interference is instituted late in the disease, and will always tax the resources of both the medical and surgical therapeutist to the utmost. Either pre-operative peritonitis which the removal of

the source of the infection fails to influence favorably, or post-operative peritonitis resulting from failure, unavoidable or otherwise, to prevent spread of infection from the immediate neighborhood of the appendix in advanced cases of the disease, constitutes the source of greatest anxiety: our resources for combating this complication are unfortunately limited, and only too frequently inefficient.

Upon the appearance of the first symptoms of this complication prompt measures should be taken to procure free catharsis, for the purpose of securing drainage of the peritoneal cavity. The use of salines following the exhibition of $\frac{1}{10}$-grain doses of calomel repeated every quarter of an hour until a grain has been taken, seems to best fulfil the indications. These may be supplemented by frequent enemata containing glycerin, turpentine, and ox-gall. Counter-irritation of the surface of the abdomen has enjoyed considerable repute in times past, and this has been most frequently effected by the use of turpentine stupes. All the benefits of this treatment can be obtained in a more efficient and cleanly manner by the use of the button-shaped attachment of the thermo-cautery heated to a white heat and barely brought in contact with the surface in a great number of places.

The beneficial influences of surface applications of guaiacol for the relief of deep-seated inflammations suggests its use in peritonitis. Care should be exercised in its use in the case of old persons and young children, on account of the atrophied skin of the former and the delicate skin of the latter. It should be diluted with either alcohol or oil of sweet almonds in the proportion of 1 to 15 or 20, and pencilled over small areas at a time and covered with a cotton poultice (cotton batting covered with oil-silk).

The ice-coil has gone somewhat out of fashion. The fact that it has been deemed scarcely possible to reach and modify the inflammatory condition through the thick abdominal walls, together with symptoms of bladder-inflammation which it has been accused of producing, have contributed largely to this. I continue to employ it, however, for the reason that it assists in lowering the general temperature and gives a sense of relief and comfort to the patient; further, I have but rarely seen bladder-irritation result from its employment.

(For treatment of General Septic Peritonitis, see article upon that subject.)

Intestinal obstruction from the formation of various adhesions is a complication to be dreaded both as an immediate and a remote complication in cases operated upon late in the disease. The necessity for the introduction of drains of any kind renders this complication more likely to occur, as well as the existence of inflammatory processes which have extended from the appendix to the region about the ileo-

cæcal valve. It is highly important to differentiate in the first few days between this mechanical obstruction and that due to septic peritonitis and intestinal paralysis, for the reason that in the former immediate reopening of the abdomen and relief of the angulated or constricted intestines is indicated, while in the latter no benefit is to be derived from operative interference. In the case of mechanical obstruction the sounds produced by the movements of volumes of gas from one part of the intestinal canal above the obstruction to another can be made out with the stethoscope, while in that due to intestinal paralysis these sounds are absent. Obstruction occurring later on will be easier of differentiation. This condition may occur at any time following the operation, and is sometimes present as a complication before operation. (See article on Intestinal Obstruction.)

Ventral hernia is also a sequel which occurs more frequently in cases the subject of late operation. The presence of suppuration prevents that solid closure of the abdominal wall which is obtained when union takes place by primary intention. The muscular and fascial edges are separated by the presence of cicatrical tissue, and this eventually undergoes degenerative changes which lead, in some cases, to its almost total disappearance—that portion which unites the skin alone, in old cases, constituting the sole covering of the abdominal contents; this in time becomes attenuated, and the intestinal coils can be seen through the thin structure. While the use of support to the abdominal surface generally may give a sense of relief to the patient, this cannot be of permanent benefit, and the wearing of a pad over the cicatricial tissue may do positive harm by its pressure, thus hastening the atrophic changes which finally occur in many cases. In pronounced or extreme instances of this troublesome sequel the plan of election is to dissect out all the cicatricial tissue and bring the muscular and fascial margins together anew.

Weakening of the abdominal wall at the site of the operation is a not uncommon result of late operations in which it becomes necessary to make an extensive dissection, prolonging the incision to the extent of injuring the nerve-supply of the parts in the immediate vicinity of the field of operation. Here, although the successive layers may be firmly united as to their edges, yet there will be a general bulging upon the side operated upon, as compared with the other. The condition is irremediable so far as at present known. An abdominal support may be of service, if there is a sense of dragging. Patients, however, rarely complain of this discomfort.

From what has been said of the dangers and inconveniences accompanying or following late operation as compared with early surgical interference much difference of opinion has existed, but the following may be accepted as the views upon this question held by

those whose experience in the disease under consideration entitles their opinion to respect:

(1) Early operation means the avoidance of almost all risk in the operation itself, even in the hands of those of average or even slight experience in operative work, provided the underlying principles of aseptic operative technique be understood and acted upon. This also secures early convalescence, the avoidance of dangerous complications and sequels, and, in addition, immunity from subsequent attacks of the disease.

(2) Late operation exposes the patient to grave dangers before, during, and following the operative procedure, and demands that the latter be undertaken only by one thoroughly familiar with all of the most difficult details of the technique of abdominal surgical work. The convalescence is prolonged, and the patient not infrequently emerges from the conflict almost a complete wreck, and may require months for final restoration to health. The mortality is correspondingly high, and the operation is frequently held responsible for the fatal issue, when, as a matter of fact, the conditions found to be present are incompatible with recovery in any event. The occurrence of vicious adhesions may lead to intestinal obstruction at any time during the life-time of the patient. The presence of ventral hernia may require a subsequent operation for its relief. In not a few instances the surgeon is compelled to leave the appendix behind, thus rendering the patient liable to subsequent attacks, the only other choice being that of submitting to a secondary operation.

While it may be said with truth that some cases operated upon might have recovered without operation, this consideration is more than balanced by the fact that no one can ensure this to the patient in any given case, much less promise him immunity against subsequent attacks, as well as the fact that the mortality of cases operated upon early, or when the infection is limited to the organ itself, is not higher than one-half of 1 per cent. in competent hands. When the patient recovers without operation the result is attributable to the fact that the disease was not beyond the power of nature to control, and not to the influence of remedial agents, for the reason that there is no drug known whose direct action is such as to effect any favorable change whatever in the inflammatory process in which the organ is involved. Finally, in cases in which recovery ensues under purely medical treatment, the patient must always dread a recurrence of the malady. The delay which medical practitioners frequently counsel in cases of appendicitis is largely responsible for the many valuable lives that have been lost from the disease since its dangerous character has become known, as well as from operative attempts instituted at a late stage of the disease, which have proved ineffectual.

The Non-operative Treatment of Appendicitis.—The non-operative or so-called medical treatment of this disease will be called for under the following circumstances:

(1) When the conditions under which the patient is placed are such as to prohibit the employment of skilled surgical aid at a time in the course of the disease when the greatest skill possible is necessary in carrying the operative procedure to a successful issue, namely, when the infection has passed beyond the limits of the appendix itself and has involved the surrounding parts, although it is at this very time, save in but a few exceptional instances, that operative interference is really most imperatively demanded.

So long as the infection is confined to the organ the operative procedure to be instituted is the simplest of all those for which abdominal section is demanded. The route is direct, the large intestine easily identifiable, the caput coli readily found, and the vermiform appendix of the cæcum brought into the abdominal wound with ease and ligated and excised. With strict limitation of the infectious process to the organ itself, with no ulceration or perforation of the appendix, and in the absence of infected serum in the abdominal cavity and suppuration in the adhesions, if such have been formed, it is still possible for the case to go on to recovery with no complicating sequelæ, although an exceptionally large and varied experience in the treatment of appendicitis impels me to insist at every opportunity that there is no means of knowing, in a given case, whether or not such a favorable course will be followed. In the majority of cases, however, the medical practitioner is quite unwilling to pass the case over to the surgeon, or even to interefere operatively himself, if he be surgically inclined, although there can be no question that, with the observance of proper aseptic precautions, many cases which perish yearly would be saved by operation; as well as that others, which pass through a fearful ordeal of suppuration and finally recover, would be brought to a safe and prompt convalescence, if the surgical procedure could be instituted at the golden moment.

On the other hand, there comes a time in a large number of cases when it becomes an extremely difficult task for the most skilled surgeon, versed in all the special technique of abdominal section necessary to prevent infection of the peritoneal cavity both from the infectious processes present in the appendix and its neighborhood, as well as from without, to deal with the conditions present in a manner at all calculated to bring the case to a successful issue. This not only involves the greatest possible care and skill on the part of the operator himself, but presupposes a degree of skilled manipulation on the part of at least one assistant, not easily obtainable in districts remote from the great centres of surgical activity. The operator must

rely more or less upon his chief assistant for the proper protection of the surrounding parts from contamination arising from contact with material at the site of the original focus of infection. Escape of coils of intestine from beneath the protecting layers of gauze must be guarded against while the operator is at work isolating the appendix and bringing it within reach for the purpose of removal; and in the absence of a trained assistant reliance must be placed upon one who, not realizing the importance of his task, fails at a critical moment, and by an unguarded or awkward movement permits the intestines to both obscure the field of operation and become infected at the same time. Any surgeon who has had much to do with the class of cases under review will realize the importance of having an intelligent and appreciative brain and skilled pair of hands opposite him, and realize how heavily he is handicapped in their absence. What, then, must be the difficulties to be encountered by the practitioner under these circumstances who has never opened the abdominal cavity at all, or who, having done so, has never been called upon to face violently infectious conditions, with adhesions easily broken down, and all the possibilities of infection of the general peritoneum continually present!

Therefore, under the circumstances of a mild attack, and in the absence of threatening symptoms, as well as with a severe attack at hand and the actual presence of the latter, if the patient be located at a point remote from surgical aid he will be likely to be treated non-operatively. For this reason it behooves us to carefully consider what course the attending physician should pursue in order to give his patient the best possible chance, next to that of operative interference, for recovery.

(2) There is a class of cases in which it may be deemed best to defer operative interference until a later period of the disease, holding the latter in reserve. These are cases in which the patient's general state will not admit of interference, and in which the general disturbance is out of all proportion to the local conditions. High fever, a rapid pulse, and great prostration may be present, and yet the local disease be comparatively insignificant. This is particularly apt to be the case during pregnancy, and the careful and experienced clinician will be on his guard, knowing the unfavorable prognosis to be apprehended with this condition complicating an attack of appendicitis, whether the latter be treated operatively or expectantly.

(3) Cases occasionally come under the care of the surgeon in which the conditions present are such as to lead him to believe that the risks involved in operating can scarcely be exceeded by those taken in declining to open the abdomen and treating the patient expectantly, however hopeless the outlook may appear. Two cases have come

under my observation and subsequently recovered which exemplify this proposition. Both occurred in children, and in both the distended abdomen, drawn and pinched features, muddy-colored surface, and rapid, feeble pulse seemed to portend a speedy dissolution. In one of these cases I explained the grave risks to be taken in the event of opening the abdomen, as well as the highly probable fatal issue if the patient was treated non-operatively, whereat the friends declined to permit the operation to be done. The final recovery of this patient impelled me to advise against interference in a subsequent case, similar in character, this patient also recovering.

In both of these cases my reasons for not insisting upon operation, as in the first case, and of advising against it in the second, were based upon the belief that the patients would scarcely be able to withstand the effects of the anæsthetic and shock combined. The attempt to eliminate the first-named factor by making the abdominal section under cocaine anæsthesia has simply resulted in greatly enhancing the effects of the last, all cases so operated upon having perished very shortly following the operation. The truth of the matter is that under these circumstances the patient is staggering along under a burden which he is just able to carry and live; any attempt at interference must necessarily increase the burden temporarily, and he dies before the beneficial effects of getting rid of a portion of his original burden can be realized.

Assuming the views here expressed to be correct—and in the present state of our experience they can scarcely be denied at least earnest consideration on the part of all—there is scarcely room for doubt in the minds of those who have been brought much in contact with appendicitis, that surgical measures, and these alone, are competent to deal effectively with the disease when the latter is progressive in character. In mild cases of catarrhal or endo-appendicitis with but slight interference with the blood-supply and in the absence of virulent infection, the inflammatory action may not extend beyond simple thickening of the mucosa, or at the most involve but slightly destructive changes, and hence these cases should quickly clear up under saline purgation and rest in the recumbent position. But even here there is a source of danger not heretofore sufficiently dwelt upon, and which is illustrated in a case coming under my care, in which, with a history of several preceding indubitable attacks of appendicitis, I was impelled to open the abdomen promptly during an exceptionally mild attack. The conditions present were such as to fully justify the procedure. The appendix was greatly distended with a muco-purulent secretion almost to the point of rupture (empyema of the appendix), and with practically no adhesions present. Upon examination after removal it was found that communication with the

cæcum had been entirely shut off by a stricture—the result of a former attack—at the appendiculo-cæcal orifice, constituting a most dangerous condition of affairs.[1]

The first point upon which the practitioner should bestow his attention upon being called to a case of appendicitis is the state of the bowels. If these are constipated an enema should be given and this followed by a dose of sulphate of magnesium or other saline cathartic, since these drugs possess the property of not only emptying the intestinal canal, but likewise of effecting drainage from the neighboring peritoneal structures by endosmotic action. To be a safe procedure, however, this must be instituted at the very commencement of the palpable symptoms. Van Cott has shown that neural and vascular changes may precede the onset of the acute symptoms, and my own experience teaches me that these may lead to rapidly gangrenous condition.[2] With these at hand violent catharsis may invite early perforative peritonitis. Therefore, if prompt emptying of the intestinal tract cannot be accomplished, it is better to forego entirely this portion of the treatment until opportunity has been afforded for the formation of protective adhesions, which may take several days. In any event an enema to clear out the lower bowel should always precede the administration of the cathartic. If the case is a progressive one and suppuration in the appendix or surrounding adhesions takes place, catharsis should also be carefully employed, if at all, for the reason that if these adhesions are rendered tense by the accumulation within their boundaries they may be easily broken down by forced peristalsis, and secondary rupture into the peritoneal cavity take place, with resulting general septic peritonitis. After the first few days the bowels may be moved by enemata daily, all straining efforts being avoided.

The patient should not be permitted to rise from the bed either to urinate or defæcate. This rule is imperative, and no argument or insistence on the part of the patient should induce the practitioner to accept the responsibility of movements on the part of the patient that may easily lead to his destruction through the supervention of general peritonitis following either primary perforation or secondary rupture. The same rule should apply to voluntary muscular efforts in bed, such as rising and turning over. None but absolutely necessary movements are to be permitted, and these should be entirely of a passive character, *i. e.* with the assistance of another. The medical attendant should ever keep before him the vision of an appendix violently inflamed, gangrenous in whole or in part, and lying loose in the cavity of the peritoneum waiting for some more or less violent

[1] *Medical Record*, Nov. 7, 1896.

[2] *A Treatise on Appendicitis*, by George R. Fowler, M. D., Philadelphia, 1894.

effort on the part of the patient or forced peristaltic movement of the surrounding intestinal coils to empty its death-dealing contents into the peritoneal cavity. Even when all seems to be going on favorably the same caution should still be exercised, for the reason that, even if the inflammatory condition of the organ is subsiding, an encysted sero-purulent collection in the surrounding area, resulting from a perforation that has healed, or an infection through the circulatory channels without perforation, will do almost, if not quite, as much damage as a primary perforation, if its barriers are broken down and its contents permitted to invade the peritoneal cavity. Rest, therefore, absolute and prolonged, should be insisted upon in a most positive and unequivocal manner by the medical attendant.

It is easier to state the contraindications to the employment of opium than to lay down rules for its use in appendicitis. It is a two-edged sword that cuts both ways, and, unfortunately, its keenest edge is turned in the direction of the patient's comfort. There is an almost irresistible impulse on the part of the practitioner to administer a sufficient amount of the drug to allay the pain completely. If the question of operation has been discussed and definitely disposed of in the negative, and the medical attendant is fully aware of the fallacies in the prognosis which this drug gives rise to—in other words, if he is not misled by the apparent improvement in the symptoms which follows its administration, and is on his guard against indiscretions on the part of the patient into which the latter is led by what to him appears to be an abatement of all the uncomfortable features of the disease—then, and only then, is its employment justifiable, to a limited extent, if other measures fail and the patient is being harassed and worn out by pain and restlessness. If the operative procedure is still under consideration, and the question of its application to the case in hand not yet settled, but, on the contrary, is made to depend upon the possibilities of improvement or otherwise within the next few hours, then, in order to form a fair estimate of the progressive or non-progressive character of the attack, and in the patient's own best interests, it is better not to mask the natural symptoms. With its complete withdrawal and steady improvement following there can be but slight opportunity for error, particularly if the symptom of localized tenderness be carefully watched and estimated at its full value. Under these circumstances the question of operative interference can be intelligently discussed, if indeed it can be said to be open for discussion at all after the first twenty-four hours of the existence of the disease with no natural and material amelioration in the symptoms. On the other hand, if opium or its preparations are permitted to mask the course of the disease the practitioner must remain more or less in the dark as to its actual possibilities, and thus be the

more readily deceived as to the indications for surgical interference, and in cases in which operation is refused, or deemed impracticable either because of the environment or other equally good reason, as to the actual state of affairs within the patient's abdomen and the necessity for constant vigilance against the occurrence of a catastrophe.

In cases in which it is finally decided to trust to nature's efforts to resist the further invasion of the disease (for, after all, this is what treatment by drugs amounts to so far as "cure" of the appendical inflammation is concerned), then it will become necessary to relieve the patient's sufferings primarily, and secondarily to secure that rest of the inflamed parts surrounding the original focal lesion so absolutely essential to the formation and maintenance of proper adhesions for the protection of the peritoneal cavity pending the subsidence of the appendicitis itself. The treatment, under these circumstances, becomes the treatment of a localized infectious peritonitis in which it is believed with reasonable probability that the lesion is of a suppurative character and must be kept strictly within its then present limits; the judicious employment of opium, *i. e.* the smallest possible dose that will keep the patient in some approach to comfort, is to be chosen and steadily adhered to save under circumstances of emergency, and is to be continued until the necessity for its employment has passed away. In its withdrawal some substitute may be given, of which bromide combinations serve the best purpose. Under the watchful care of an alert practitioner opium may, with proper precautions, become an unmixed blessing in the treatment of appendicitis in the class of cases in which its employment is admissible; in the hands of one less vigilant and unmindful of its treachery its becomes a Lorelei beckoning on the innocent victim to his destruction.

With the occurrence of an inflammatory mass in the right iliac region (and this should be sought for occasionally, the gentlest manipulation only being admissible, examination by percussion being largely substituted for palpation) the watchfulness of the medical attendant must be redoubled. The more acutely painful symptoms now subside, and, since the adhesions have become well formed, there is a double indication for the lessening of the dose, or the withdrawal of the drug altogether save for the purpose of allaying impatience and restlessness on the part of the patient, or for securing sleep at night. These may perhaps be as well secured by small doses combined with one of the bromides, or the latter may be found sufficient alone.

Local applications are of but little use in arresting the disease, yet the application of a small ice-water coil, or a rubber bag filled with ice, is a favorite application with many medical men, and occasionally patients declare that it affords relief from pain. For this reason alone

it should be employed, since it thus enables the attendant to cut down still further the amount of opium employed.

During all this time the nutrition of the patient must be kept up and his general system fortified against the septic material which is being slowly fed into his circulation and distributed to his tissues, or eliminated by the natural outlets. The skin and kidneys are important agents in the last-named particular, and should receive attention. The food should be such as will leave the least possible amount of residuum and still be sufficient for the needs of the system, having in mind the undesirability of administering cathartics for the forced emptying of the intestinal canal. Milk, white of egg in water, and farinaceous gruels and meat broths are indicated, sufficient variety being furnished to make these acceptable to the patient. Digestive disturbances should be met by a change in the diet, if one or two of the allowed articles only have been used, and the administration of remedies such as hydrochloric acid and the digestive ferments.

Febrile disturbance is not usually a grave feature of the disease, and hence antipyretics are but seldom demanded. Their use, like opium injudiciously administered, only tends to mask the real conditions. If sepsis is present the synthetically prepared antipyretics, such as phenacetin, antipyrin, and antifebrin or acetanilid, only have the permanent effect of weakening the cardiac muscle, and hence will be harmful if given. Tonic doses of quinine are admissible, and, according to the dose given and the susceptibility of the patient thereto, the antipyretic action obtained properly discounted in estimating the patient's condition as based upon the temperature indications.

The use of strychnine has a proper place in the therapy of appendicitis, and this drug may largely replace the employment of alcoholic stimulants. With failing strength its employment, in $\frac{1}{30}$-grain doses, in connection with quinine, digitalis, or sparteine is useful. Nitroglycerin with caffeine aids the action of the kidneys in their eliminative function by raising the blood-pressure and lessening the resistance in the capillary circulation, and hence these drugs are useful both in this respect as well as in their influence upon the flagging heart.

The occurrence of rupture of an intra-peritoneal encapsulated abscess is marked by the sudden subsidence of the inflammatory mass and symptoms pointing to the route chosen by nature in getting rid of the offending pus. If this be into the peritoneal cavity the characteristic symptoms of acute general peritonitis soon manifest themselves. There is an accelerated pulse-rate, great abdominal pain, accompanied by an anxious countenance and followed by tympanitic distention and vasomotor paralysis. If by the intestinal canal, there

soon appears a diarrhœa, or at least several loose discharges, according to the amount of pus which the abscess-cavity contained, with the indubitable evidences of the presence of pus in the stools. If by the bladder, pus, and in some instances fæcal matter, if both routes have been chosen, will be present in the urine. Under these circumstances symptoms of cystitis make their appearance and require treatment. In the female the discharges may take place from the vagina. The collection may make its way through the diaphragm and perforate the base of the lung after the formation of pleural adhesions, and escape into a bronchus. In at least one instance with which I am familiar the occurrence of this latter accident was followed by the patient's sudden death. He was literally drowned by the rapid flow of the pus. The pleural cavity may receive the collection forced upward by the pressure from below, and an "empyema necessitatis" follow, if the patient survive. The pus may escape in a post-peritoneal direction and invade the deep structures of the back, or follow the iliac vessels over the pelvic brim into the thigh and simulate a psoas abscess in its final pointing. Least likely of all, it may discharge into the abdominal wall and terminate as a parietal phlegmon, pointing by preference in the neighborhood of the umbilicus.

The treatment to be pursued under these varying circumstances of spontaneous evacuation will vary with the route chosen by the advancing pus. If the direction taken be into the peritoneal cavity the patient's doom is sealed, and, beyond the benefits to be derived from euthanasia, the medical attendant's functions cease: opium in sufficiently large doses to tide the victim over the last agonies is alone indicated, from the purely medical standpoint. Even surgery offers but little hope, for the patient's condition at this stage of the case is generally such as to prohibit the use of an anæsthetic, much less will it permit the additional shock incident to opening the abdomen in the face of profound collapse and general sepsis, which rapidly supervene.

If the pus is evacuated through the bowels, beyond an occasional low enema nothing need be done. If the communication between the fæcal current and the abscess-cavity is into the small intestine reinfection of the latter usually takes place, and this may be repeated again and again until either the patient's strength is exhausted or the surgeon is called in to right the matter by providing a route for the escape of the pus by means of abdominal section and drainage. The fæcal fistula which follows is best treated by a subsequent plastic operation. If the abscess-cavity has emptied into the colon or rectum the outlook is more favorable, for by the use of enemata the lower bowel can be kept empty and the fæcal current diverted from the opening in a certain proportion of cases. Cathartics are not to be given under these circumstances, the object being to avoid as far as

possible the presence of liquid fæcal matter in the invaded bowel; otherwise the conditions present in the small intestine will be produced and healing of the communication delayed, or prevented altogether. Even with all the care in this respect possible, reinfection is apt to occur and an operation become finally necessary.

If the bladder has been invaded the resulting cystitis must be met by washing out the bladder occasionally by means of boric-acid solutions. The bladder should not be entirely filled with the solution. Infection of one or both kidneys may result from failure to keep the cystitis within bounds or the bladder disinfected. If the intestine and bladder are both invaded these efforts must be redoubled. Surgical interference (suprapubic cystotomy) alone will suffice when this latter complication arises.

The vaginal route is perhaps the most favorable of all those mentioned. The opening is usually in the vault and affords direct drainage, and borico-salicylic acid (Thiersch's) solution, used as a vaginal douche, fulfils all the indications.

The diaphragmatic route, next to that leading into the peritoneal cavity, is the least favorable. In addition to the immediate dangers from flooding the respiratory tract, those arising from septic pneumonia are to be apprehended. The prognosis of empyema resulting from the presence of the discharged pus, as well as the suppurative process set up in the pleura itself from infection, is most grave and is to be met by operative procedures designed to evacuate the collection and provide free drainage at once.

The escape of pus into the post-peritoneal connective tissue and its invasion of the deep structures of the back is soon followed by grave constitutional disturbances of septic origin. If the pus makes its way along the route followed by the vessels and appears in the thigh, the collection may be evacuated by an incision and drainage established. The same course is to be followed in case the route followed by the pus leads into the abdominal wall.

Other complications to be feared are hepatitis of septic origin; septic emboli form in the mesenteric veins and are swept into the portal circulation. This is announced by pain and tenderness in the region of the liver, jaundice more or less pronounced, and increased constitutional disturbance. The outlook under these circumstances is grave, although the case is not necessarily a hopeless one. No specific medication will be of use. Suppurative hepatitis is to be feared, and occurs in a certain proportion of cases.

In cases ending in pyæmia every effort should be made to maintain the patient's failing powers. The free administration of malt liquors is often of service. Isolated foci of pus should be opened early, even when these attack the joints. Quinine is of service.

PARATYPHLITIC ABSCESS.

While the great majority of cases of supposed typhlitis and perityphlitis, as well as typhlitic tumor and paratyphlitic abscess, have their origin in inflammation of the vermiform appendix, yet cases of suppurative inflammation in the right iliac fossa, originating in the neighborhood of the cæcum or caput coli, do certainly occur in which the operative procedure discloses a normal appendix, or even after the latter has been removed for appendicitis. This is true, in spite of the more generally received opinion that abscesses in this region are exclusively of appendical origin—an opinion so widespread that recent writers, as a rule, entirely ignore the possibilities of their occurrence from other origin. Between this and the opposite extreme, held by Dupuytren and afterward put forth by Albers, there is probably ground for dissent from both opinions.

Paratyphlitic abscess is a suppurative inflammation in the connective tissue about the cæcum. This may occur in the normal structures or in the adhesions which have previously formed from inflammatory conditions of the cæcal wall (typhlitis) and its serous covering (perityphlitis). The typhlitis itself may have its origin in fæcal accumulation (stercoral typhlitis of Lenander), this tending to a catarrhal inflammation, limited to the mucous membrane, or to a parietal typhlitis whose seat is in the interstitial or intermuscular structure of the wall of the cæcum, with engorgement of the vessels and the presence of an exudate in the perivascular spaces. Or, it may occur from nutritive disturbances of the bowel-wall, following (1) vascular changes (endarteritis obliterans and thrombosis or embolism of the vessels of the meso-cæcum), with resulting ulceration or the occurrence of gangrenous areas with perforation; or (2) neural lesions with consequent trophic changes in the bowel-wall. Finally, it may result from the action of some foreign body or the presence of dysenteric, typhoid, or cancerous ulcers. The mechanism of the infection consists, in those cases in which no perforation exists, in bacterial migration, the causative lesion robbing the intestinal wall of its natural property of intercepting the passage of micro-organisms through its tissues, and, in the cases in which perforation occurs, in direct infection from contact with the fæcal contents of the bowel.

Symptoms and Course of Paratyphlitic Abscess.

The symptoms of paratyphlitic abscess are the presence of a tumor in the right iliac fossa, the appearance of which has been preceded by the more or less sudden occurrence of pain and tenderness in this region. These, in their turn, may have been preceded by loss of appetite, disturbances of digestion, and constipation, and followed by

slight fever, and occasionally vomiting. If the case is seen in the stercoral typhlitis stage a doughy mass may be very readily felt in the neighborhood of the right iliac fossa. Considerable distention may take place in the course of the case from accumulation of fæcal matter and gas. In exceptionally severe cases intestinal obstruction may occur. Localized peritonitis is always present. The suppurative collection may perforate posteriorly and invade the retro-peritoneal connective tissue and simulate a perinephritic abscess, or follow the space between the lateral abdominal wall and the colon and perforate the diaphragm. It may invade the sheath of the psoas muscle and find its way to the thigh. Flexion of the right thigh will be present in these cases.

Diagnosis.—Paratyphlitic abscess is of exceptional and even very rare occurrence as compared with the frequency of appendicitis, from which disease it is to be carefully differentiated. It is of less abrupt onset than the latter, and the pain is less severe and more distinctly localized from the commencement. The general symptoms are less pronounced, as a rule, although an appendical lesion may go on to perforation and lead to general septic peritonitis without serious preceding constitutional disturbances. The tumor in paratyphlitic abscess, in cases of stercoral origin, is present from the commencement of the symptoms, while in appendicitis there is usually seen in acute cases supervening upon a chronic condition following a former attack, a distinct period of from two to four days, between the onset of the attack and the appearance of a tumor. In typhlitic tumor the mass is sausage-shaped, situated at the site of the cæcum, can be indented by the finger, and is less tender than the tumor of appendical origin, which may be lower down below the level of the anterior superior spinous process of the ilium, is irregularly shaped, and, unless the symptoms are masked by opium, exquisitely tender. When suppuration has taken place in the paracæcal structures attempts to establish the differential diagnosis will be futile save through an operative procedure. In the simple catarrhal and even sometimes in the parietal form of typhlitis the symptoms are promptly relieved if the bowels are well acted upon by a laxative. Cases of paratyphlitic abscess resulting from perforation following ulcerative action, gangrene of the bowel-wall, and foreign bodies, are usually impossible of differentiation from appendical lesions. In case of doubt it is better to lean to the side of appendicitis.

Prognosis.—The prognosis is favorable if the suppurative process is not permitted to find its way into regions inaccessible for purposes of complete drainage after incision.

Treatment.—Complete rest in bed, the administration of a saline cathartic, and the local use of an ice-bag will be appropriate measures

of treatment if instituted in the stage of fæcal accumulation, and before the occurrence of localized peritonitis. If the latter supervene opium may be given in cautious doses. As soon as suppuration occurs the collection is to be evacuated. This may frequently be done without invading the peritoneal cavity by making the incision as for ligation of the epigastric artery, and crowding back the peritoneal fold, so as to gain access to the abscess-cavity.

In cases with sudden onset, in which perforation has probably already occurred, the operation should be promptly done as for appendical lesions. In all cases in which the fullest and most positive evidence of a preceding stercoral typhlitis cannot be obtained the patient should be given the benefit of the doubt and the case treated surgically as for appendicitis.

INTESTINAL OBSTRUCTION.

For purposes of general classification intestinal obstruction may be divided into the following:

1. Constriction of the bowel from without (strangulation).
2. Obstruction from displacement and simple flexure (angulation).
3. Obstruction from twist and complex flexure (rotation).
4. Obstruction from blunt pressure from without (compression).
5. Obstruction from closure of the intestine from within (coarctation).
6. Obstruction from plugging of the intestine from within (obturation).
7. Tract of bowel paralyzed (dynamic).

Two, or even more, of these forms of obstruction may be combined in the same case.

The following clinical forms are distinguished:

1. Internal strangulation.
2. Intussusception.
3. Volvulus.
4. Congenital occlusions and acquired strictures.
5. Fæcal obstruction.
6. Foreign bodies.

1. **Intestinal Strangulation.**—In this form of obstruction the constriction or occlusion of the bowel takes place from its peritoneal surface. It includes (*a*) obstruction by pressure of adventitious tissue or bands from pre-existing peritonitis, fœtal or otherwise, adhesions of inflammatory origin causing abnormal displacements and fixation of the intestinal tube and consequent "kinking" or angulation; (*b*)

obstruction from the presence of the remnants of the omphalo-mesenteric duct known as Meckel's diverticulum; (*c*) the presence of openings in adjoining folds of peritoneum, such as mesenteric and omental slits, into which a knuckle of intestine is forced and becomes imprisoned; (*d*) appendical inflammatory lesions in which the inflamed appendix becomes adherent in such a position as to partially surround a portion of adjoining intestine in a constricting loop, or acts as a band and produces obstruction by pressure; and finally, (*e*) true internal hernia, a portion of intestine entering the duodeno-jejunal fossa and there becoming incarcerated by the musculus suspensorius duodeni of Treitz acting as a band.

2. **Obstruction arising from Intussusception.** — In this form there is invagination or telescoping of one part of the intestine into another, due to irregular and forced peristalsis. The invagination always occurs from above downward, and includes the following varieties: (*a*) colic, in which the invagination is limited to the colon; (*b*) ileo-cæcal, in which the ileum is prolapsed into the ileo-cæcal aperture; (*c*) enteric or ileal, when the small intestine alone is involved; (*d*) the colico-rectal, the colon descending into the rectum; (*e*) the rectal, the rectum invaginating into itself.

3. **Volvulus.**—In this form a twist of the bowel upon its mesenteric axis occurs. Its location is usually at the sigmoid flexure. The twist becomes more pronounced as distention of the bowel above the lesion progresses. Nutritive changes in the intestinal wall occur early and bacterial migration and septic peritonitis follow, as a result of which the parts involved become firmly fixed in their abnormal position.

4. **Congenital Occlusions and Acquired Strictures.**—These include (*a*) absence of a portion of the intestinal tube from arrest of or imperfect development, such as imperforate anus, absence of or defective union between the sigmoid flexure and the rectum, the pylorus and duodenum, etc.; (*b*) strictures from morbid growths, either malignant or benign, of which the former are by far the most frequent; (*c*) cicatrical contraction from healed typhoid and other ulcers; (*d*) occlusion arising from the pressure of pelvic and abdominal tumors, and from the presence of inflammatory exudates about the bowel.

5. **Fæcal Obstruction.**—Accumulation of fæcal matter in an isolated portion of the intestinal canal arises from a local arrest of peristalsis, and results, if sufficiently prolonged, in paralysis of the involved portion of bowel, and finally, with increased size of the mass and its desiccation and hardening from absorption of its fluid constituents, obstruction from plugging of the bowel and stenosis of the adjacent intestinal canal. Its most frequent seat is the large

intestine in the neighborhood of the caput coli and cæcum. Septic inflammatory conditions may arise when the wall of the gut is greatly distended or under circumstances of pressure from exceedingly hard masses within the bowel and resulting interference with the nutrition of the bowel-wall and bacterial migration. It follows most frequently a constipated habit, and is observed oftenest in females and in the aged. It may be due remotely to congenital conditions, and is favored by sedentary habits. Other predisposing causes are hysterical and hypochondriacal conditions and spinal cord affections.

6. **Foreign Bodies.**—Obstruction by foreign bodies includes that which arises from gall-stones, enteroliths, and masses of lumbricoid worms, as well as substances swallowed, such as coins, buttons, etc., and certain medicinal substances (magnesia and bismuth). Gall-stones are most frequently arrested in the ileo-cæcal region and enteroliths elsewhere in the small intestine.

Symptoms and Course of Intestinal Obstruction.

Intestinal obstruction may be acute or chronic in its onset and course, according to the cause of the obstruction. Further, there may be present symptoms of a chronic or slowly progressive character for a time, these being followed by symptoms pointing to the supervention of acute obstruction.

Acute obstruction is characterized by abdominal pain, nausea and vomiting, tympanites, and inability to pass gas by the rectum after the point below the obstruction has been emptied; occasionally tenesmus, when the obstruction is low down, and sometimes the presence of a dull tumor. Distended coils of intestine sometimes elevate isolated portions of the abdominal wall, forming a tympanitic tumor. Moderate rise of temperature may be present.

In chronic obstruction due to impacted fæces diarrhœa may be present at first. The mucous membrane in the neighborhood of the impaction becomes the site of a catarrhal inflammation and the secretion furnished passes alongside of and through the mass, carrying with it some fæcal matter. This, however, soon ceases and symptoms of complete obstruction slowly occur. There is a sense of fulness and weight in the abdomen, with general uneasiness, loss of appetite, foul taste and furred tongue, and pain, induced by pressure, referred to the distribution of the sacro-lumbar nerves. Swelling of the abdomen occurs, and, sooner or later, a tumor is made out. A general lethargy is followed by prostration, or symptoms of obstruction of an acute character may supervene. When the obstruction is due to malignant disease of the bowel-wall, there will have existed constipation previously, and, in isolated instances, some pain and localized tenderness which is increased by the administration of cathartics. There is

increasing difficulty in effecting movements of the bowels, with loss of weight and strength, and anæmic dyscrasia.

Hiccough may be present in either form. Fæcal vomiting, and expulsion of brownish-covered serous contents of the small intestine without apparent effort, occur finally in nearly all cases of complete obstruction of the small intestine. Fæcal vomiting is not nearly so constant a symptom in obstructive conditions of the large intestine, although in volvulus at the sigmoid flexure it may be an early and prominent symptom. The evidences of tumultuous peristalsis in the shape of gurgling sounds are sometimes apparent both to the patient and the attendant, and when not so apparent may be obtained by auscultation. The stools are stained with blood in malignant disease of the lower bowel, and tenesmus, followed by bloody mucus in the stools, is especially characteristic of intussusception, although not always present. Localized peritonitis results from bacterial migration and infection from the interior of the intestine following disturbances of the normal physical characters of the intestinal wall from whatever cause. This occurs with especial rapidity in volvulus, the twist of the mesentery interfering early with the nutrition of the bowel. Fatal cases of intestinal obstruction are marked by typical and early collapse, the effects of the stercoræmia being particularly manifested upon the nervous system. There is vasomotor paralysis, a bluish-red color of the surface, lowered temperature, and feeble pulse.

In cases primarily acute the practitioner may suspect either internal strangulation, internal hernia, intussusception, or volvulus. In all cases the usual sites of hernia, viz. the inguinal, umbilical, and crural outlets, as well as the unusual localities in which this occurs, such as the perineum, the obturator foramen, and lumbar region, should be interrogated. In chronic obstruction cicatricial narrowings, stricture from malignant and benign neoplasms of the bowel-wall, occlusions from tumors or inflammatory processes, and foreign bodies or fæcal impactions, are each to receive due consideration in the differentiation.

It is not usually difficult to reach a conclusion that obstruction actually exists, although acute enteritis, acute poisoning, and strangulated hernia have all been mistaken for intestinal obstruction. The most frequent diagnostic errors, however, relate to appendicitis and peritonitis (see pages 576 and 586).

The anatomical diagnosis, save in indubitable cases of fæcal impaction, is always difficult and frequently impossible without the aid of exploratory abdominal section. The seat of pain in all varieties and situations of intestinal obstruction is apt to be at or near the umbilicus, and when not so located is generally diffused. Tenderness

is not always present, and in any event its situation is barely suggestive, much less diagnostic. From the greater frequency of fæcal vomiting in cases of obstruction in the small intestine, this symptom may be of some service in the differentiation. A tumor felt by the finger in the rectum or vagina is suggestive of intussusception when acute symptoms are present. Digital exploration of the rectum may reveal a stricture or other evidence of disease, if this be within reach. On the other hand the lesion may be located in the large intestine high up, or in the small intestine, in which case it will not be accessible to digital exploration. Exploration with the hand in the rectum is a procedure the results of which, as a diagnostic measure, have not justified the risks taken in its employment. The Sims position used in gynecological work is convenient for digital, and the knee-elbow position for instrumental, examination. In fæcal obstruction the uneven mass may be sometimes felt in the course of the bowel.

Obstruction high up in the small intestine is accompanied by scantiness of urine and moderate distention at the upper portion of the abdomen. There is flatness below and in the sides. Small movements may be obtained by enemata, but the distention will not be influenced thereby, although the latter will be temporarily diminished by vomiting, washing out the stomach, or the expression of large quantities of gas *per os*. With duodenal and jejunal obstruction the vomiting is not fæcal. When the obstruction is in the ileum the distention is central until the distended coils of small intestine overlap the colon; the vomiting becomes fæcal finally.

If the obstruction is in the lower portion of the colon there may be tenesmus and bloody and mucous discharges. Some writers lay stress upon increase of indican in the urine. The differences between the extent of the tympanitic distention present in obstruction of the small intestine and that of obstruction in the colon, save very early in the former, are not sufficiently great to be diagnostic. Attempts to measure the capacity of the portion of the large intestine below the seat of obstruction, and thus form some estimate of the location of the latter when this is believed to be in the colon, are sometimes made, but, as a rule, with only indifferent success. The large intestine of the adult, if filled to the ileo-cæcal valve, will hold about six quarts. Since the fluid will not reach beyond this point, theoretically one should be able to estimate the seat of the obstruction in the colon by the amount of water which can be introduced. In the absence of accurate knowledge of the capacity of the colons of children and infants considerable danger would be invited by persistent efforts to fill the bowel, as rupture might take place, particularly after nutritive changes had occurred in its walls. Pressure from a height of three feet in an infant, and eight feet in an adult, is within the limits of safety.

In order to eliminate the voluntary efforts at evacuation on the part of the patient the latter would have to be anæsthetized. To prevent the fluid from returning the buttocks should be pressed closely together about the injection-tube. The patient is to be placed upon the right side, or, better still, inverted. With all precautions the results may be misleading, since one-fourth of the amount supposed to represent the entire capacity of the large intestine to the ileo-cæcal valve has been introduced into the rectum alone. It is said to be possible to demonstrate the arrival of the fluid in the cæcum by auscultation.

In considering the cause of the obstruction a knowledge of the proportion of cases in which the different forms of obstruction is found upon autopsy is useful. 35 per cent. of all cases are found to be due to intussusception, and about the same proportion to strangulation by bands, inflammatory adhesions, appendicular lesions, diverticuli, and true internal hernia. Of the remaining 30 per cent. fully one-half are due to volvulus, 8 per cent. to obstructions by abnormal contents or foreign bodies, of which gall-stones are the most frequent, and 6 per cent. to tumors, cicatricial contractions, and strictures from neoplasms of the bowel-wall.

If the anatomical diagnosis can be assured and the large intestine determined to be the seat of the obstruction, about one-half of the cases will be found to be due to intussusception. Volvulus is next in frequency (30 per cent.), the remainder being accredited to tumor-pressure and strictures from morbid growths in the bowel-wall. If in the small intestine, about three-fourths of all cases occurring in this locality are due to strangulation. Next in frequency comes obstruction by gall-stones (14 per cent.). Volvulus is still less frequently met with in this locality, although cases are occasionally observed. Owing to the greater mobility of the small intestine occlusion from tumor-pressure is scarcely ever observed. About 1 per cent. of the cases of obstruction about the immediate neighborhood of the ileo-cæcal valve are due to stricture.

Volvulus rarely occurs under forty, and intussusception over thirty. The latter is much more likely to be present in children, and, with its abdominal tumor, bloody stools, and rectal tenesmus is much more easily recognized than any of the other forms, save only cancer, which is essentially a disease of middle adult and advanced life. 75 per cent. of the cases of intussusception occur at or near the ileo-cæcal junction, and 50 per cent. of the cases of volvulus are found near the sigmoid flexure. Stricture due to malignant disease as well as from other causes is likewise most frequently at or below the sigmoid, and may sometimes be felt by digital examination. Twists at this point do not usually convey any definite information to the examining finger.

VOMITING.—Information may be derived from a study of the symptom vomiting. In obstruction in the duodenum and jejunum this may occur early, but is not fæcal in character. If in the ileum or at the lower end of the small intestine, it occurs early, is severe and persistent, and becomes fæcal only later on in the attack. If in the large intestine it is longer delayed, is less severe, and may not become fæcal until later, if at all.

PAIN.—The pain, in strangulation, is an early and prominent symptom as compared with the other forms of obstruction. The peritonitis which follows volvulus is more sudden in its onset and spreads more rapidly than in the other forms. In strangulation this occurs later in the case, and may be absent altogether, the patient dying from toxæmia of intestinal origin.

DISTENTION.—In general peritonitis the bowel is greatly inflated from paralysis of peristalsis, and immobile as a whole. In strangulation and volvulus the involved portion of the bowel alone is inflated at first, and its mesentery being fixed mechanically at the point of constriction, this portion is free from peristaltic movement. The efferent or leading-off portion is contracted, while the afferent or leading-to portion, in case of strangulation low down, fills up slowly. In strangulation high up the afferent portion becomes more rapidly distended. In cases of obstruction by plugging the distention gradually decreases in volume as we approach the stomach. In addition to this there is not such pronounced diffused interference with peristalsis, the different intestinal coils filling and emptying themselves repeatedly.

Sixty-eight per cent. of all cases of strangulation give a previous history of peritonitis, and in 12 per cent. there have occurred some form of intestinal disturbances attributable to interference with the function of the tube, if, indeed, they are not made out to be real attacks of obstruction, more or less complete.

Symptoms pointing to inflammatory processes in the region of the gall-bladder and duodenum may sometimes be obtained as a part of the history in cases of obstruction from impacted gall-stone. Preceding biliary colic and icterus are only valuable as suggesting the formation of calculi. Gall-stones sufficiently large to cause obstruction usually pass directly into the bowel from the gall-bladder by perforation.

The after-course of the case following the entrance of the gall-stone into the intestine can but rarely furnish information bearing upon the occurrence or seat of its arrest.

Early vomiting and prostration are the significant features of an obstructive lesion in the small intestine, while tenesmus and bloody stools are the striking characteristics of that of the larger intestine.

The possibility of a diaphragmatic hernia—with its history of an injury, distended and tympanitic area upon one-half of the thorax, restricted respiratory movements, feeble breath-sounds, and diminished vocal fremitus and vocal resonance—occurring coincidently with symptoms of intestinal obstruction, should not be overlooked.

Fæcal obstruction usually furnishes a history of subacute onset and chronic course. The insidiousness of its development may throw the practitioner off his guard. Its recognition depends mainly upon the demonstrated presence of a tumor with irregular surfaces lying in the course of the intestine. It occurs more frequently in the large than in the small intestine, and above the ileo-cæcal valve or sigmoid flexure.

Finally, the possibility of the occurrence of intestinal obstruction from more than one cause should be borne in mind. Thus, the starting-point of a fæcal obstruction may be a cicatricial contraction from an old ulceration, and a stricture originating in malignant disease may not have encroached sufficiently upon the lumen of the gut to give rise to obstructive symptoms until it serves to arrest the passage of a large gall-stone. The latter occurred in a case operated upon by myself.

In general terms it may be stated that the more violent the onset, the more severe and persistent the pain, and the more profound the collapse, the greater are the probabilities that either strangulation or volvulus is present.

So far as the success or failure to differentiate between the conditions causing the obstruction and its bearing upon the indications for operation is concerned, it may be said that such differentiation is frequently impossible and always unnecessary. In all cases the diagnosis can be made by exploratory abdominal section, and this course is imperatively demanded, both from the diagnostic and therapeutic standpoint.

Prognosis.—In obstruction from causes residing within the gut, such as foreign bodies, gall-stones, fæcal impaction, etc., as well as occlusion of the gut from tumor-pressure and the presence of the products of inflammation, the prognosis is more favorable than when the obstruction is due to strangulation from bands, angulation, or rotation. The mortality in all forms, however, unless operated upon early, is high. Operative interference is not usually undertaken until the patient's strength is exhausted or general peritonitis has supervened, with the result that an undeserved opprobium is cast upon the surgeon's work. The following experience is illustrative of this:

Lobstein[1] collected 60 cases of obstruction due to gall-stones not operated upon. Of these 29 died unrelieved, the gall-stone passing

[1] *Beiträge zur klin. Chirurgie*, Bd. iii. Th. 2.

on and the patients finally recovering in the remaining 31. On the other hand, out of 31 cases turned over to the surgeon for operation 19 died. From Lobstein's statement of the condition of these patients when they came into the surgeon's hands, it is apparent that they belonged with the necessarily fatal cases without interference of the first collection. On the other hand, the fact that they recovered is evidence that the 31 favorable cases, in which the gall-stone was finally passed, were cases of incomplete rather than of complete obstruction. Further, the results obtained in the second collection, viz. 12 out of 31 cases, are to be considered as extraordinarily favorable, since, between pre-existing septic inflammatory conditions, prostration, and the existence of complete obstruction, the majority were beyond hope when the operative procedure was instituted.

The occurrence of strangulation is the important feature in acute cases, the fate of the bowel itself being of far greater importance than the mere occurrence of obstruction to the passage of fæcal matter.

L. Rehn [1] obtained 10 recoveries out of 13 cases of acute intestinal obstruction by early operation. Of these the majority were cases of strangulation and torsion. One was a case of flexion due to the presence of a suppurative collection, the symptoms disappearing after evacuation of the pus. One was a case of displacement of the sigmoid flexure due to the presence of the fœtal sac in a case of abdominal pregnancy.

All cases of hyperacute intestinal obstruction, *i. e.* those involving interference with the function of the bowel itself and causing nutritive and destructive changes in its walls, invariably prove fatal without operation. The prognosis in operated cases will largely depend upon the promptness with which the abdomen is opened and the bowel released from its dangerous environment, the damage inflicted upon the intestine and mesentery, and the effects of this upon the system at large.

Treatment.

Abdominal Section for Intestinal Obstruction.—Inasmuch as the incision must be largely of an explorative character in acute obstruction, for the reason that it will rarely occur that a positive anatomical diagnosis will have been made with sufficient certainty to warrant the surgeon in making his incision directly over the supposed site of the obstruction, this is usually made in the median line, and extends from the umbilicus above to the ensiform process, or below to the pubis. The incision is made generally by preference through the linea alba, although this is not always distinct below the umbilicus ; it may pass through either one or the other recti muscles. By some this latter is considered an advantage, the muscular cicatrix giving rise

[1] *Archiv für klin. Chirurgie,* Bd. xliii. Th. 3, 4.

to less liability of ventral hernia. Great care must be exercised as the peritoneum is reached, if there be much distention. This structure must be held well away from the abdominal contents by a pair of mouse-tooth forceps while a small opening is made. This is enlarged without releasing the peritoneum until the index finger of the left hand can be introduced. The further enlargement of the opening can now be done by means of the blunt scissors or knife, using the finger as a guide and exercising great care that neither the omentum or intestine above nor the bladder below are wounded. One or two vessels may require clamping for a short time; these do not, as a rule, require ligature.

If it becomes necessary to prolong the incision during the operation this may be done by means of the curved scissors. In carrying it above the umbilicus the incision should be curved around the latter on the left side in order to avoid the suspensory ligament of the liver.

As soon as the cavity of the peritoneum is opened, hot bottles or gauze compresses should be at hand for covering the distended coils of intestine and supporting these as they tend to escape externally. The sigmoid flexure and the ileo-cæcal region are first subjected to an inquiry as to the existence of a twist at the site of the former, or intussusception, gall-stone obstruction, or neoplasm at the site of the latter. The next object must be to search for collapsed small intestine, which may be generally found by following the distended coils in the direction in which the distention increases, this leading to the point of obstruction. Finally, collapsed gut will be found, and when this has once been identified it is but a question of short search between the distended coil above and the flattened intestine below before the place of obstruction is identified. The character of the obstructing agent is now determined and measures taken to release the involved intestine if the obstruction be from without the gut; remove the offending substance if from within; resect the intestine if the obstruction resides in its walls, or if the latter have become gangrenous from prolonged constriction or torsion of the vessels of supply in the mesentery; connect together the portion below with that above the obstruction by means of either lateral or circular enterorrhaphy following resection, or, it being found impossible to resect the diseased parts, the application of intestinal anastomosis and elimination of the diseased portion by either lateral implantation of a portion of intestine from above into healthy intestine below the obstruction, following section at the former point, and closure of the diseased portion of the bowel, or flatwise approximation of two bowel-surfaces with communicating slits in such manner as to "short circuit" the intestine and carry the fæcal current around the point of obstruction.

Finally, under circumstances demanding that the operation be

brought to a termination as quickly as possible the operator may be compelled to resort to the formation of an artificial anus for the purpose of temporarily relieving the patient, leaving it for the future to decide the best method, if any, of relieving the patient from his unfortunate environment. Under circumstances of excessive distention these manipulations will often be seriously embarrassed, and will be found necessary to empty the coils either by aspiration or incision.

When general peritonitis is present this must be treated upon the lines laid down in the chapter devoted to that disease. In the absence of this complication, and if infection has been avoided during the operation, the abdomen may be closed at once. If fæcal extravasation has occurred, the parts contaminated must be cleansed as rapidly as possible by wiping out with gauze. The question of flushing the abdominal cavity is still *sub judice*. If resorted to, a six-tenths of 1 per cent. solution of chloride of sodium in sterilized water is to be employed. A teaspoonful of common salt to the quart will be sufficiently accurate when the solution must be improvised.

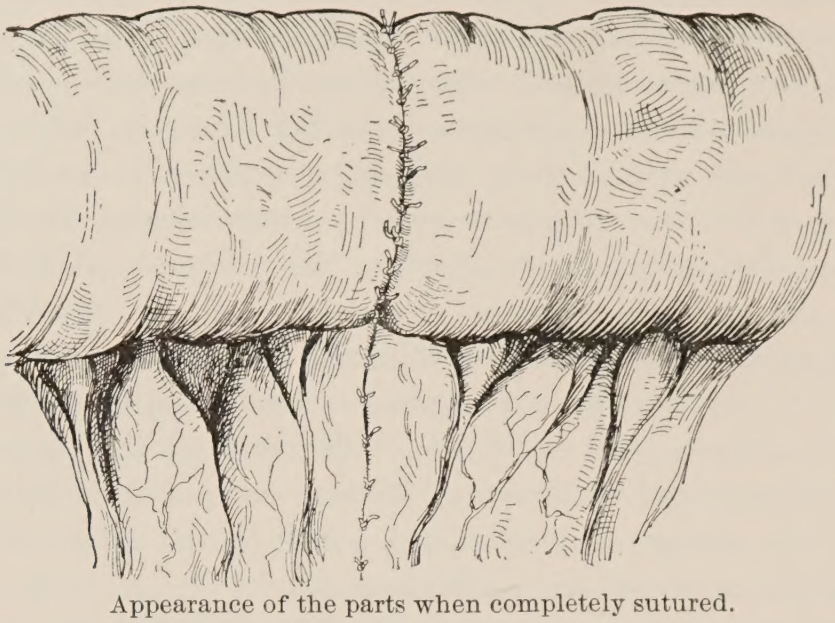
Resection of the Intestine.—The diseased portion of the bowel must be completely excised, together with a V-shaped piece of the mesentery, and the latter tied in sections. The adjacent portions of bowel must be emptied and cleansed as soon as divided. The further escape of fæcal matter into the field of operation must be guarded against, either by the application of a suitable clamp, by passing a narrow strip of gauze through the mesentery, *well away from the attachment of the latter to the bowel*, lest some of the blood-supply to the latter be interfered with, and twisted to constrict the bowel slightly, or by the thumbs and fingers of an assistant making compression. The latter is always to be preferred when available.

The suture of the divided bowel should always begin at the mesentery, and it is here that the greatest care is necessary in order to secure against leakage. After this has been done the suturing is to be completed. The interrupted Lembert suture of silk should be employed. Continuous Lembert suturing is not to be used, for the reason that it has a tendency to produce a purse-string effect and cause constriction of the bowel at this point. When completed the parts should present the appearance shown in Fig. 30.

Since extravasation and general peritonitis is the most frequent cause of death after the operation, it is wise to leave a narrow strip of gauze in contact with the suture-line, and led out of the abdominal wound, to provide against the accidental giving way of a stitch; this is to be removed after forty-eight hours. As additional security Senn sutures a portion of the great omentum over the entire row of sutures in circular enterorrhaphy, thus completely encircling the suture-line by a detached omental graft an inch wide.

Lateral anastomosis after resection has no advantages over circular enterorrhaphy as just described. Even with the most rapid technique

FIG. 30.



Appearance of the parts when completely sutured.

yet devised it will be necessary to close the divided ends of the bowel, which, if properly done, will probably consume quite as much time

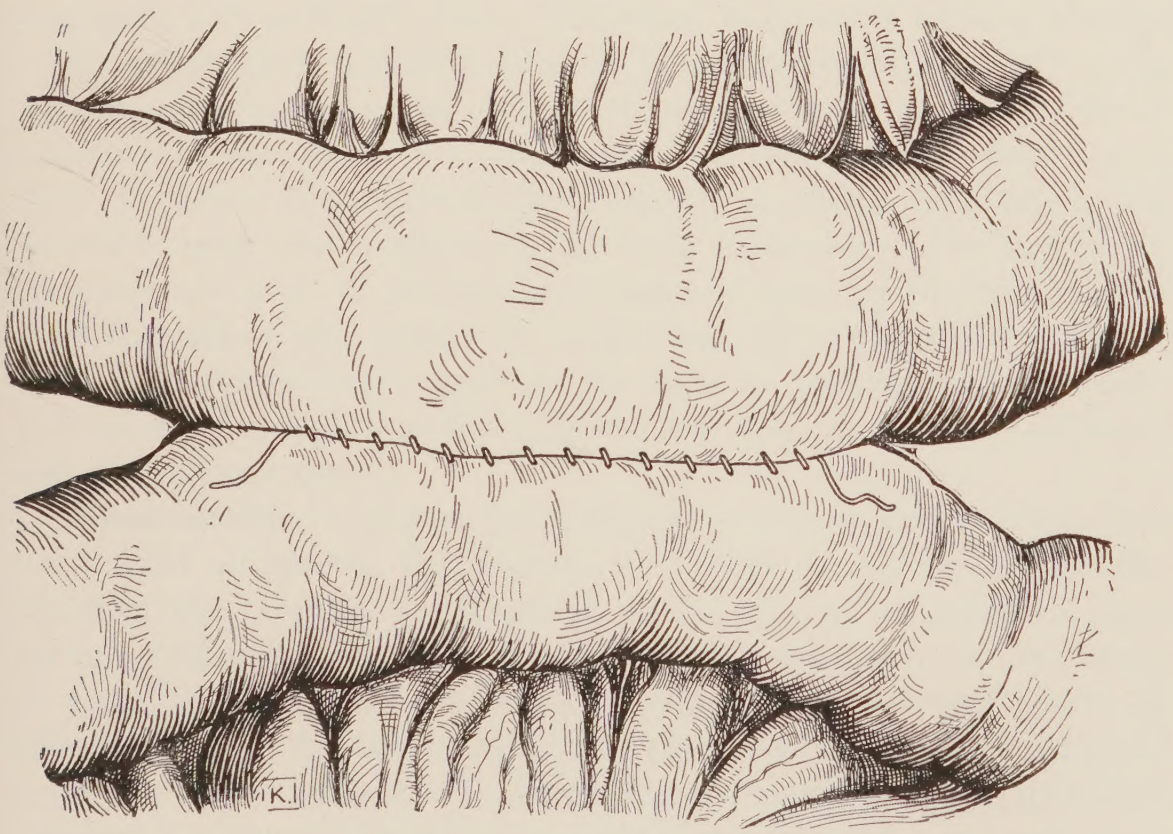
FIG. 31.

The first stage in intestinal anastomosis.

as that which has been saved by the application of the plates of bone after Senn, or the potato-plates of Dawbarn.

Intestinal Anastomosis.—This operation is designed to unite portions of the intestinal tract more or less distant from each other, without the necessity of resecting an intervening portion of the gut. It is a useful expedient in cases in which the patient's condition is such as to demand haste, as well as under circumstances of extensive disease where resection cannot be done. Its largest field of usefulness is in the small intestine, a coil as near as possible to the obstruction and above the latter being selected for the purpose, and applied to the coil immediately below. The slits of communication should be made diametrically opposite to the mesenteric attachments, and, to allow for subsequent contraction, which always occurs, the opening should be not less than two inches in length. The suturing should be done in two stages, the first consisting of uniting the edges farthest from the operator by a continuous stitch, as shown in Fig. 31. In cases demanding urgent haste the hemming of the cut edges, as shown in the drawing, may be omitted. The second stage consists of uniting the edges nearest to the operator by another continuous suture, and finally applying a second suture-line all the way around the approximation-line (Fig. 32).

FIG. 32.



The second or final stage in intestinal anastomosis.

The method of intestinal anastomosis by suture is far safer than by mechanical devices, but the time required is somewhat longer.

In all operative attacks upon the intestines the parts to be operated

upon must be brought outside of the abdominal cavity when possible, and the remainder of the viscera protected by warm towels or large gauze compresses during the manipulation.

In closing the abdominal wound following this, as well as all operations involving the cavity of the peritoneum through the anterior abdominal wall, it is essential that the parts should be properly approximated, and primary union obtained, in order to avoid the subsequent development of surgical hernia.

DISEASES OF THE RECTUM AND ANUS.

By JOSEPH M. MATHEWS, M. D.

It is the purpose of the writer to try and deal with the subject of Diseases of the Rectum and Anus in a practical way. In the last decade much has been written concerning the treatment of these diseases, and it cannot be gainsaid that the necessity exists. Surgeons of much repute have been giving special study to the subject, and no work on surgery or medicine is now considered complete that does not give consideration to this most important class of diseases. Recognizing the fact that from time immemorial, patients suffering from rectal disease had but little offered them in the way of relief, save by the itinerant quack or charlatan, it is but meet and proper that the physician of to-day should be well posted in their treatment, especially in a palliative way. The time has passed when a *placebo*, such as ointments, powders, etc., can be presented satisfactorily to the patient suffering from any one of those numerous complaints which commonly affect the rectum and anus. He will either at once recognize the gross ignorance of the physician so doing, or after a trial hasten to some one in whom he has more confidence. No part of the anatomy has been so outrageously imposed upon by the pretender as have the rectum and anus. In times past the regular physician has seemed to intentionally neglect this class of patients, and therefore it is no wonder that they have fallen into the hands of the illiterate and pretentious quack.

Examination.—Disease in the rectum is oftentimes made manifest by decided symptoms that cannot be mistaken; at other times the manifestation may be so obscured or the disease so insidious as to make a diagnosis very difficult. To achieve success in the treatment of rectal diseases one must be able to differentiate between a score of affections which by the medium of reflex action simulate a diseased condition of the rectum. To jump at conclusions without a plausible process of reasoning would only result in grave error. It seems to be nearly universal for patients suffering from any diseased condition of the rectum to designate the same as "piles." Hence the physician often makes the mistake of prescribing for a disorder that the patient has diagnosticated, and that he is not really affected with. Therefore

it cannot be urged too strongly that in every case an examination of the parts should be made.

Much paraphernalia is not necessary in order to make a thorough examination of the rectum; indeed, in the majority of instances a speculum will be found superfluous. Before placing the patient upon the table for ocular inspection, etc., it will be found advantageous to ask some questions or to have him describe his symptoms. The following might be suggested: The age of the patient. How long affected. The amount of pain; character of pain; whether it is connected with act of defæcation or not. What the character of fæces: whether moulded or not; whether bowels are constipated or loose. State if blood, mucus, or pus is found in stools: if blood, whether light or dark. Whether bowel protrudes at stool: if so, does it replace itself, or does patient put it back? What is the condition of the kidneys? do they act too often or not often enough? State the amount of urine passed in twenty-four hours. Has the patient ever had syphilis? Is there a tubercular tendency in family? Has the patient ever had gonorrhœa? Has he ever been told that he had stricture of the urethra? If the patient is a female, ask whether married or single; if she has ever borne children; if any rupture of perineum, etc., took place; if any ovarian or uterine pain exists; if any discharge from the vagina, prolapse of womb, or difficulty of urinating. Ask concerning any special diathesis, such as rheumatic, neuralgic, etc. Note loss of flesh, especially so if rapid.

Any one or all of these questions may prove of service in properly diagnosticating a case. It must not be presumed, because a patient complains of rectal trouble, that in all cases the seat of disease is in the rectum. Very often the rectal symptom is but a cry from the real seat of disease through the medium of a nerve. The writer has had under treatment five cases where the patients came to him to be treated for rectal disease when in truth none existed, and the symptoms were traced to a displaced kidney. It is well known that a stricture in the urethra will often give the most pronounced pain, irritation, etc. in the rectum. An enlarged prostate is one of the most frequent causes of irritability, etc. in the rectal walls. A displaced womb may often set up symptoms which point to this part of the anatomy. It may be incumbent then to make a general examination of all contiguous organs before stating positively that the rectum is accountable for the symptoms presenting. In this connection it might be well to call attention to the fact that the coccyx is sometimes responsible for great disturbances in the rectum. It is well, therefore, to examine this little bone, and to inquire after any trauma that may have happened to it; and also not to forget that it may be the seat of disease outside of the trauma. A constitutional diathesis should

never be forgotten in making up the verdict of disease in the rectum or elsewhere. Whether a physician is prepared or not to operate in these diseases, his general knowledge should be such as to enable him to ferret out the real cause and seat of the disease. Presuming, then, that all proper questions have been asked, an examination should now be made; in other words, the physician should not take the patient's diagnosis, and prescribe without making an ocular inspection of the parts before prescribing. A flat, hard table, a rectal speculum, a pair of dressing forceps, are all that is needed for this examination.

Placing the patient on the table, in Sims' position (on left side), with a good natural light, first inspect the buttocks, anus, perineum, thighs, and scrotum for any abnormal condition. Much evidence may be obtained by this inspection. For instance, the following may be detected: External piles, fissures, condylomata, eczemas, external opening of fistulæ, discharges from the rectum, external growths, syphilitic erosions, gonorrhœa in women, etc. Next, anoint the fore finger and gradually introduce it into the anus. The following should be noted while this is being done, viz.: The condition of the sphincter muscle, whether close and rigid or loose and patulous; whether hypertrophied or thinned; whether resisting or non-resisting. With the finger in the rectum the following conditions can be diagnosticated: First of all, note the prostate gland if the patient is a male—whether enlarged, sensitive, indurated, or softened. In the female, the position of the womb—whether or not any displacement that may be responsible for any of the rectal symptoms. In obscure cases the examination of the uterus and its appendages should be made. In the virgin it is well to inquire after the menstrual flux—whether regular or irregular, painful, profuse or deficient in quantity. The bladder should not be neglected in searching for a cause of rectal disturbance: vesical irritation is a frequent factor in these cases. Stone in the bladder may often be found when least suspected, and prove a great source of reflex irritation to the rectum.

After making a thorough investigation of contiguous parts, the rectum can be further explored with the finger, the best of all methods, and the following conditions may be detected: Polypi, openings of internal fistulæ, strictures, ulcerations, cancer, internal piles (when *indurated*), abscess, foreign bodies, etc. Ordinary internal hæmorrhoids that have not undergone atrophic change or the inflammatory process cannot be detected with the finger.

The Speculum.—In the vast majority of rectal cases it is not necessary to make an examination with the speculum; it is generally a painful procedure and reveals but little. The person who is *au fait* in making such examinations can more readily make a diagnosis with the finger than by any other means. The speculum should only be

used after the finger has failed to detect the trouble or the clinical facts in the case demand its use—such as obscure hæmorrhage, pain, or a discharge of pus, mucus, or a combination of the two. Perhaps the openings of internal fistulæ can be diagnosticated by sight through a speculum, especially if the discharge can be seen. Internal hæmorrhoids will fall between the blades of the speculum, of course, but a much better impression can be gained by having them protruded by the patient.

The Probe.—The probe is of but little utility in any rectal disease except perhaps fistula in ano, and is overestimated in this affection. It can just as well be told that fistula exists, if a sinus can be *felt*, or an opening *seen*, as to explore with a probe. It makes very little difference under which head—internal, external, or complete—the fistula may be designated, as each must receive the same treatment.

Sounds.—Many varieties of sounds are used for the purpose of diagnosticating rectal affections, especially when the disease is located high up the rectum. The advantages of such are purely chimerical, and the disadvantages very apparent. *Imaginary* strictures are often found, because of the catching of the sound in the folds of the gut, or perhaps by meeting with a natural obstruction, such as the promontory of the sacrum, the uterus in the female, or an enlarged prostate in the male. Besides, a sound may prove to be the source of great danger. If of metal or hard rubber it may be pushed into the peritoneal cavity, especially if a pathological condition exists, as cancer, ulceration, etc. If any instrument of the kind is to be used it is much better that a soft-rubber one, such as Wale's rectal bougie, be kept on hand for this purpose. It is twelve or fourteen inches long, and by injecting water through it the whole length of the rectum can be explored without danger.

To sum up, it can be truly said that 80 per cent. of rectal disorders can be diagnosticated by the use of the finger, and the remaining 20 per cent. by taking the clinical history of the case, and by the use of the speculum, and that it is seldom necessary to use either probe or sound.

Preparation of Patient for Operation. — The modern surgeon realizes that the terms minor and major surgical operations are ill defined. The chief risk in all wounds is from sepsis, and the microorganism can enter through a small wound as well as through a large one. Many of the operations around the rectum might under said classification be called minor, when in truth, if every safeguard is not thrown around the patient, infection may speedily take place and the termination be a fatal one. The writer recalls one death from tetanus, following the ligation of hæmorrhoids. Therefore all operations

around the rectum should be done under strict antiseptic precautions. The rectum, as is well known, is abundantly supplied with lymphatics, and its blood-supply is enormous. The pathogenic germ finds here a ready entrance into the system. At best, this portion of the gut is difficult of perfect asepsis; hence the greater should be the effort of the surgeon. Whatever may be the differences among surgeons as to the necessity of employing agents to produce an antiseptic condition (chemicals) or simply procuring an aseptic field, certain it is that the antiseptic method is to be preferred in rectal work.

In preparing a patient for an operation in this line there are a number of things to be looked after: First, the habits of the patient should be known. For instance, in operating for hæmorrhoids in the drinking man it is of much importance to look after the liver for several days before operating. The portal circulation in such a patient is greatly interfered with. It is well to order in a case like this a good dose of calomel for two or three consecutive days, and then a thorough passage with a saline. It should be understood that perfect abstinence from drink should be observed for a number of days before the operation. Before operating for any rectal disease (especially an obscure one), affections of contiguous organs should be carefully noted, else a confused prognosis will likely be made.

Having determined that the case is a suitable one for operation, the following plan will be found a serviceable one: A free purge should be given the day before the operation. The next morning the rectum should be washed out with a large enema of hot carbolized water; the patient is then given a bath, the parts are shaved, and he is ready for the surgeon. When under the effect of the anæsthetic the whole field of operation should be scrubbed with soap, and then washed with a bichloride solution. The sphincter muscle is now divulsed and the rectum thoroughly irrigated with bichloride solution 1 : 5000. Then the operation is proceeded with.

It seems to be the impression with some that whatever may be the necessity for strict antiseptic measures in surgical work, the rectum is to be neglected in this particular. It is very true that because of its peculiar office it is difficult to procure a perfectly aseptic condition of the parts; but it would be a grave mistake to neglect every effort to accomplish this result. As has been stated, the rectum is the seat of an abundant blood-supply and lymphatic distribution which readily invites sepsis. Every rule laid down for antiseptic surgery should be carefully followed when doing these operations. Quite a number of cases of tetanus are reported as following rectal operations, and it can be readily understood that general sepsis could obtain. After a complete bath of the body the local field should be scrubbed with soap and water, and irrigated with the bichloride solution. Then with a

good speculum the sphincter muscle should be widely dilated and the irrigating process extended to the rectum for a number of minutes. All wounds that are made in doing the operation should be dressed with iodoform or bichloride gauze, and the instruments of course sterilized before the operation. Dressings should not be allowed to remain on long enough to become septic, but removed as early as the exigencies of the case demand. It is true that the dry dressing plan is to be preferred in all surgery around the rectum, but the interval between the changing of dressings must be in accordance with antiseptic rules. With each change thorough irrigation of the parts must be practised. The surgeon neglecting such precautions must expect to have the same bad results as would obtain in doing any other surgical operation. It is not the purpose of the writer to name any special agents to accomplish good results, but simply to advise that antiseptic precautions be taken in every case.

HÆMORRHOIDS.

It is a singular fact that a majority of patients suffering from rectal or anal trouble will designate it as "piles." It is more singular that many physicians will take the diagnosis of the patient and prescribe some local application, without once making an examination of the parts. The same physician would not think of taking the patient's opinion concerning disease in other portions of the body, therefore why trust to his diagnostic power when the malady attacks the rectum? Patients often imagine that a very slight trouble in this part of his body is of the gravest sort, and it is often a difficult matter to satisfy his mind that a fissure of the anus, or the presence of a small hæmorrhoid, is not a cancer of the rectum. *Per contra*, very formidable disease here is treated by the patient as a very simple affair. It is, then, a matter of great importance to examine each case—by ocular inspection at least, and generally by the aid of instruments. It is a question with some as to which one of the rectal affections predominates. If the patient's opinion is to be taken into consideration the question could be quickly settled in favor of "piles," for this is nearly the unanimous verdict. If the doctor's who prescribes indiscriminately for these affections the same local remedy, the same verdict could be had.

In speaking of this subject, Mr. Allingham in his most excellent work says: "Fistula is, at all events in hospital practice, the most common rectal disease affecting the adult. Out of 4000 cases taken consecutively and without selection, at St. Mark's Hospital, from the

out-patient department, there were 1057 persons suffering from fistula, and 196 from abscess, of which 151 subsequently became fistulæ, so that more than one-fourth of the cases treated were fistula." This has not been the experience of the writer, but instead, hæmorrhoids has predominated in his practice as a rectal affection. In making this statement it is intended to include all varieties of hæmorrhoids, both external and internal. It has been argued by some writers that climate plays a part in the production of the hæmorrhoidal condition, and that habits incident to certain nations as well as individuals do also. As to the former statement, it might seem plausible that in the hot climate this affection would be oftenest found, but the experience of the writer does not bear out the assertion. As to national habits, especially the drinking one, it might be asserted that England cannot boast of any special abstinence over the States. Again, it must be remembered that fistula may be only a complication of some other trouble, and not only secondary but caused by it. It is a familiar fact that stricture of the rectum often is the originating cause of fistula, and in making up statistics of such a case it should be put down as a case of stricture, and not of hæmorrhoids. Therefore, after an observation of several thousands of both affections, the writer is constrained to believe that hæmorrhoids predominates as a rectal affection, at least in United States.

For convenience of description as well as treatment, a division will be made between external and internal hæmorrhoids. It is sufficient for the patient to know that he has a case of piles, but the physician must draw the distinction between them in order to give the case rational treatment. Indeed the same methods will not obtain in both. To illustrate: a patient suffering from an enlarged and inflamed external pile is always making a strenuous effort to push it into the rectum, when its place is outside the sphincter muscle, and any handling for the purpose of "reducing" it adds to the patient's discomfort.

External Hæmorrhoids.

External hæmorrhoids are generally described under two varieties, viz. *venous* and *cutaneous*. The term *thrombotic* would be more appropriate in describing the first variety, for it is really a *blood-clot*. It has been discussed by some writers whether the clot coagulates in the vein proper or in the tissues. This matters very little as far as the treatment goes. The seat of both varieties is at the verge of the anus, and they cause about the same amount of disturbance. Some have applied the term "blind piles" to the external variety in contradistinction to the "bleeding" variety of internal piles. To say the least of the term, it is unsurgical and signifies nothing. The symptom of bleeding is always of much significance to the patient, and the one

that first causes him to seek advice from the physician. Whenever bleeding occurs it is safe to affirm that it is from an internal pile. External piles do not bleed, although there is a "mixed" variety which is partly external and partly internal, found just at the verge of the anus, from which blood will escape from the internal portion. This small tumor is covered by true skin externally, but has mucous membrane lining the upper portion. By taking hold of the lower part of the tumor and drawing it downward and outward the inner portion will be exposed.

SYMPTOMS.—The symptoms of external piles generally come on suddenly, the patient likely feeling no discomfort in the morning, but before night being aware of decided trouble. Pain is the most prominent symptom, and the patient seeking for a cause finds this tumor at the verge of the anus. Not knowing of the varieties of piles, and imagining that this tumor belongs inside the rectum, he immediately begins an effort to push it inside, thereby adding to his distress. The pain arising from the venous or thrombotic pile is caused by tension; that from the enlarged tag of skin, from the inflammatory process. Itching often accompanies an attack of external piles, and proves to be distressing. If the patient does not quit work, his condition grows worse because of the exercise and irritation of the parts. His habits, too, have much to do with the aggravation of his symptoms.

CAUSES.—It is often a difficult matter to trace the cause of an attack of external piles. Many persons have a superfluous amount of skin, or tags of skin, around the anus. This condition, of course, could be easily excited to the inflammatory process by irritation, filth, etc. It would also be set up by a teasing diarrhœa or dysentery. The use of rough or printed paper, or other coarse articles as detergents could excite to the same condition. The thrombotic pile is oftenest caused by straining at stool, as for instance in the constipated habit, though many persons who have this habit never suffer from piles. It can be understood, too, that a diarrhœa or dysentery could produce that straining effort which would rupture a vessel. Many persons, however, will report for treatment for external piles who have no such diseases and are of perfectly cleanly habit. It is believed by some that such habits as drinking or smoking act as a factor in producing external piles. Such habits are much more likely to produce internal piles. Certain it is that any local irritation of the parts from whatever cause will aid in producing an attack. Among these agents may well be mentioned the bicycle. The continued sitting upon the saddle incident to a long ride is a common cause of the trouble. The writer has operated upon one patient three times for external piles caused by riding the "wheel." Some authors

believe that pressure by a displaced uterus upon the rectum may cause external piles. An enlarged prostate or a stricture in the urethra may act as exciting causes to this affection.

Treatment.

The treatment of external piles should be to a great extent prophylactic. Even children should be taught the necessity of a daily evacuation of the bowels. Patients generally should be instructed to avoid the straining effort at stool, and the importance of leaving the seat as soon as the bowels are through acting. Very many persons, especially in the country, are in the habit of using common printed paper as a detergent. This should be strongly condemned. The mucous membrane everts when the bowels act, and nothing is more irritating to it than ink; indeed, it would be well to discard all paper from the water-closet and use instead cold water for the purpose of cleanliness. No paper can thoroughly cleanse the anus after the act of defæcation, but the water will. Besides, the source of irritation is gotten rid of. If, however, a patient presents himself with a case of external piles he should be properly cared for. There is more pain and discomfort attending an attack of the external variety than from an ordinary attack or the presence of internal piles.

An examination should be made of the parts to determine which variety of piles is to be dealt with. The rectum should also be investigated in order to find out if some other pathological condition does not exist which of itself may be the cause of the attack of piles. If it is an uncomplicated case, palliative measures alone may allay the attack. By "attack" is understood the inflammatory condition which is manifest in the tag of skin or the presence of a blood-clot in the tissues.

The bowels should be cleared with an aperient, such as a dose of salts, castor oil, or citrate of magnesium. No active exercise should be indulged in, and really it would be better for the patient to assume the recumbent position, but it is not often the case that you can induce him to do so "for so trivial a cause." Heavy eating, such as much meat and bread, and the use of wines or other liquors should be interdicted. The bowels should have a liquid movement each day, and after each stool cold water should be freely applied. In some few cases the use of hot water seems more soothing to the patient and should be preferred. It is seldom necessary to poultice the parts. The inflammatory process will subside under this plan of treatment in about one week or ten days. Ointments do but little good save to allay itching; the best for this purpose will be found one containing menthol, such as—

℞. Vaselini, ℥j (30.);
Menthol., gr. xl (2.6).—M.
Sig. Apply to the parts after washing.

If there is an abraded surface, the following will be found of service:

℞. Vaselini, ℥j (30.);
Hydr. chlor. mit., gr. xxx (2.);
Menthol., gr. xx (1.3).—M.
Sig. Apply.

If the mucous membrane is exposed, as usually will be the case in the combined piles, exciting to pain, this prescription is a good one:

℞. Vaselini, ℥j (30.);
Hydr. chlor. mit., gr. xx (1.3);
Cocain. hydrochlorat., gr. xij (0.78).—M.
Sig. Apply after bathing the parts.

Washes are sometimes used with benefit, and I know of none better than the fluid hydrastis, pure or diluted, or the fluid extract of pinus canadensis, used in the same manner. Such agents as sugar of lead, alum, or tannin can also be used for the same purpose.

It must be admitted, however, that all these agents simply allay the attack of inflammation, and after it has subsided the "tag" still remains, to be irritated on some future occasion by a similar cause. For a radical cure it is much better to cut off the tag or tags, or *excise* the little blood-tumor. Such a procedure gets rid not only of the exciting cause, but of the tumor itself, and all fear of another attack is dissipated. The plan of "letting out the clot," so commonly practised in the second variety of external piles, will be found far less serviceable than to excise the tumor. Even with the best of precautions it will be found that the patient is just as long recovering from the attack when the palliative plan is followed as he is if the tumor is removed after the manner suggested. Muriate of cocaine can be used successfully in these cases (by injection) if it is thought best not to use a general anæsthetic.

Internal Hæmorrhoids.

Varieties.—It is common for authors to divide internal hæmorrhoids into three varieties, viz. capillary, arterial, and venous. No such distinction can positively be made, because oftentimes all three varieties may be found in the same patient, or the blood-supply of a tumor be both arterial and venous. A much simpler classification would be into *external* and *internal* piles, the external piles being

those found external to the sphincter muscle, and the internal piles being those originating inside of the sphincter. It makes very little difference as far as the treatment is concerned whether a pile is of the venous or arterial sort. It is well to draw a distinction between bleeding and non-bleeding piles: those that do not bleed are not at all dangerous; and, again, hæmorrhage is of all symptoms the most important to the patient.

Capillary Hæmorrhoids.—The capillary pile is the most insignificant of all as far as size is concerned, but is the most dangerous of the three varieties. Excessive hæmorrhage may take place from this variety of hæmorrhoid. It is not infrequent that large quantities of blood are lost in this manner, and a few deaths have been reported from hæmorrhage arising from a capillary pile. Of course, in such a case an arterial branch is concerned, and from this a fatal hæmorrhage might occur. The writer has had a number of cases of violent hæmorrhage from internal piles, but in every instance it was from a small and not from a large tumor. This variety of hæmorrhoid is not larger than the end of the little finger, sometimes much less, and resembles a raspberry in appearance. In the main they are made up of capillary vessels, but some vessels that feed the growth are of good size. When subjected to ocular inspection they are granular in appearance, but as time advances the friction to which their surfaces are subjected does away with this rough or granular condition, and the mucous membrane extends over them. Therefore it is in the incipient stage especially that they are dangerous through hæmorrhage. Later on the areolar tissue becomes thickened, and by plastic deposit the disposition to bleed is checked.

Venous, Internal Hæmorrhoids.—The venous pile is supposed to be the largest in size. Oftentimes, especially in the feeble, relaxed subject, they get to be as large as a small orange. They prolapse easily at stool and are sometimes difficult to replace. They do not bleed unless ulcerated, and generally the only symptom complained of is inconvenience in "putting them back," or the patient complains of soiled linen from their presence. It is a mistake to suppose that the entire blood-supply in this variety is venous, as the name would imply, for they may also receive arterial distribution. However, the hæmorrhage from this variety of pile is generally venous and is not followed by any serious consequences, especially in the healthy subject. In some this bleeding is said to be advantageous.

Arterial Hæmorrhoids.—Strictly speaking the term "arterial hæmorrhoid" is a misnomer. No hæmorrhoid is exclusively made up of one set of vessels. The arterial blood-supply may predominate, as it undoubtedly does in the arterial variety of piles, but there is also a venous circulation, and it is in this class that great danger exists in

the injection with carbolic acid or any other agent capable of coagulating the blood. The arterial pile is made up of dilated blood-vessels, and connective tissue abounds in them. For this reason it is out of the question to suppose that they can be cured or eradicated by the "squeezing" process, as proposed by Manly and a few others.

Symptoms and Diagnosis.

It is quite an easy matter to diagnosticate *internal* piles, as such, but it would be a difficult matter often to say whether a tumor was of the arterial or venous variety. In the first place neither variety has hæmorrhage for a symptom, and should blood escape no differentiating between the two could be done, inasmuch as either venous or arterial blood could issue from either class. It is much easier to diagnosticate a capillary pile than to draw a distinction between the arterial and venous kind. Hæmorrhage is the chief symptom complained of, and all symptoms of the two other varieties are absent. For instance, a patient states that while at stool a copious hæmorrhage took place, which was perhaps repeated each succeeding day; that the blood was of bright color, and came in spurts; that no protrusion of the bowel occurred, that a feeling of dizziness succeeded the loss of blood; that pallor of countenance followed; and that pain was not a factor in the case.

It will be observed that all of the prominent symptoms of the large variety of piles are absent, viz. protrusion, which requires the replacing of the tumors; pain, which is often caused by friction; and the other symptoms which have been mentioned as characteristic of the arterial and venous variety. When such symptoms are present, an examination of the rectum should be made with the speculum. The tumor may be so small, soft, and velvety as to elude detection by the finger, and it should also be remembered that this form of pile may be located at a little distance up the bowel, at least higher up than either of the other two varieties. With a good light, and a speculum that will dilate the sphincter muscle well, this little tumor can be easily found. Generally the force used to open the bowel will open up afresh the bleeding vessel, and the blood can be seen to spurt or bubble up at the site of the tumor.

To diagnosticate the other two varieties of internal hæmorrhoids an entirely different method should be practised. When hæmorrhage is a prominent symptom, and occurs in any great quantity, it can be safely said that it is not from either the arterial or venous variety, certainly not from a large or well-formed tumor, for in such we find cell-growth and abundant connective tissue, the result of plastic infiltration. This checks the avenues of hæmorrhage, and it could only occur as the result of trauma or some force equal to the break-

ing of an artery. That this sometimes occurs cannot be disputed, but is not the rule. The capillary pile is a soft, spongy, or granular mass, which yields easily to slight force, hence bleeding *is* the rule. It can be said, then, that great danger can lurk behind capillary piles—in hæmorrhage—and that from the large, well-formed pile there is but little danger to be apprehended. When it is suspected that internal piles exist other than the capillary kind, it should be asked whether protrusion of the mass takes place at stool. If no such history is given it can be safely said that if hæmorrhoids exist, they are not of much size. It must be remembered in this connection that the patient's diagnosis or opinion must not be taken, as he will invariably call any disturbance around these parts hæmorrhoids.

Although the fore finger is the best agent that we can employ for examination of the rectum, it absolutely fails as an aid to making a diagnosis of internal piles. Even pile-tumors of good size cannot be detected with the finger after they are returned within the rectum. There is but one exception to this, and that is when the tumors have undergone the atrophic condition, are sessile, or pedunculated. The reliable way is to have the patient retire to the water-closet and "strain" the mass out, so as to be *seen*. If he should fail in this, dilate the sphincter with the speculum, and the tumors will be seen to fall between the blades.

The symptoms of internal piles are not well marked and certainly are not characteristic of the disease. Pain in the thighs, back, and loins; a frequent desire to pass water; general lassitude, etc. may be complained of, but these symptoms may exist from many other causes. It is better to look after the symptoms referred by the patient directly to the anus or rectum, and by an examination determine if there is any pathological change.

It is very common to ascribe constipation as a cause, or more properly speaking the chief cause, of internal piles. This belief cannot be borne out by fact. It can safely be said that the majority of people who suffer from piles are not of the constipated habit. It may exist, and of course sometimes does, but it is rather a coincidence than a cause of piles. That there is a hereditary predisposition to the hæmorrhoidal condition is pretty certain. It will often be found that whole families are given to the trouble. Patients often cite the fact that their parents, if not their grandparents, were the subjects of piles. Of course it must not be overlooked that the child-bearing woman is often the subject of internal hæmorrhoids. In these cases the tumors will be found just at the verge of the anus, and oftentimes in a prolapsed state. Children very seldom are afflicted with internal piles, though some such cases have been reported. In extreme old age piles are not often found, although they may have

existed in former life—they undergo atrophic change and, in common parlance, "dry up."

Uncomplicated internal hæmorrhoids cause very little disturbance, but when the seat of inflammation or ulceration cause great pain and distress. Such an outbreak is designated by the patient an "attack" of piles. This term can be used in regard to both external and internal piles. The tumors may remain quiescent for a long period of time, and seemingly without cause will become inflamed, and many distressing symptoms result. Patients will often use an expression like this, "I have often had piles before, but I was cured by some simple remedy, and have not had them for a long time"—when in truth he has had them ever since the first attack, but when the inflammatory symptoms subsided he considered himself cured. Although generally the patient cannot trace the cause of his "attack," it may sometimes be found as the result of a diarrhœa, flux, exposure to cold, bicycle or horseback riding, excessive venery, rough handling of the parts, the want of cleanliness, the use of alcoholic stimulants, and sometimes excessive smoking.

There is a "mixed" variety of pile which is not discussed by the authors, save by the author in his book on *Diseases of the Rectum*. It consists of both true skin and mucous membrane. The external part appears as a long tag of skin, and when pulled on a portion of the mucous membrane is everted, which is much thickened and highly congested. In operating for this variety of pile it is necessary to ligate after making the incision around the base, as in the event this was not done violent hæmorrhage could ensue.

In making the diagnosis of internal hæmorrhoids, all contiguous organs should be examined, in order to determine whether they play a part in the production of the rectal disease. An enlarged prostate, or a stricture of the urethra, may cause excessive straining, which would aid in the production of piles; a displaced womb or an irritated ovary might be a factor; stone in the bladder, a diseased kidney, hernia, varicocele, etc. might exist and result in decided reflexes, and aid in producing an attack of piles or other rectal symptoms. A proctitis which antedates the hæmorrhoids may be the cause of the inflammatory attack, or a colitis of long standing may be the exciting cause. In looking to a cure of internal piles, especially by palliative measures, every one of the above-named conditions must be sought for and eliminated, or corrected. The physician who expects to be successful in the cure of disease in any local portion of the body must be familiar with disease in a general way, or he will be making all manner of mistakes. It is the painstaking diagnostician that is the successful practitioner of medicine.

Palliative Treatment of Internal Hæmorrhoids.

The same thing that was said in regard to the treatment of external piles will obtain in the treatment of internal piles, viz. it must be highly prophylactic. The habits must be looked after, the secretions corrected, and symptoms which have a tendency to produce the hæmorrhoidal state should be treated. It is well recognized that the free use of spices and condiments—mustard, pepper, pepper-sauce—such things as the epicure is fond of, is productive of hæmorrhoids and other forms of rectal trouble. If, then, a patient is concerned about the hæmorrhoidal condition, or indeed other rectal trouble, it would be well for the physician to interdict the use of all such articles. There can be no question that the person who uses alcoholic or malt liquors to excess is more liable to hæmorrhoids than those who abstain from such drinks. The portal circulation is interfered with by such habits, and as long as they are indulged in but little could be done by the physician to effect a cure; or, granting that the patient is willing to abstain, it is well before beginning any special treatment for hæmorrhoids to look after the liver. Certainly before operating upon a patient given to the drinking habit, mercurials should be given for a number of days in succession, followed, of course, by aperients or laxatives. This class of patients are also given to over-eating. The appetite is really a morbid one stimulated by drink, and the overcrowding of the stomach is productive of grave results. The diet of the patient should therefore be looked after.

The class of patients who suffer from hæmorrhoids will sometimes be found of the constipated habit. If so, it will prove to be a most formidable complication and difficult to overcome. Such people should be advised to become water-drinkers—drinking as much as half a gallon per day, at intervals. For such, fruit should be freely prescribed—oranges, apples, figs, prunes, etc. Quite a good suggestion is to have the patient take prune-juice once a day, prepared in the following manner: Make a small bag of linen or cotton cloth, and put into it a handful of senna leaves. Place the bag with the prunes and boil for a sufficient length of time. When done strain the juice, and drink a small quantity once or twice a day. It will have a nice effect over the constipated habit.

Very often these patients will be of a morose or melancholy disposition and take very little exercise. Nothing is more conducive to good health than exercise; and, of all methods, walking is the best. The patient should be advised to take regular walks, especially in the early morning and late in the evening.

But we are to suppose that the patient presenting is suffering from an actual condition of hæmorrhoids: what advice or treatment is to

be afforded? Under such circumstances it of course must be determined what character of hæmorrhoids the patient is suffering from. If hæmorrhage is the symptom, and no history of protrusion is given, it would of course be presumed to be a case of capillary piles. These are seldom accompanied by pain, and it is the sight of blood that has driven the patient to consult the physician; or it may be the drain upon the system occasioned by the frequent hæmorrhages. This condition will often be witnessed in the female, who, from the loss of blood by menstruation together with the same from piles, suffers to such an extent as to produce profound anæmia. The main thing in such a case is to stop the hæmorrhage. To do so will be found a more difficult matter than is generally supposed. Ordinary astringents, those that are usually prescribed in such cases, have but little action for good. Reference is made to alum, tannin, borax, and others of this class. Besides, such procrastination might end in serious results. If the bleeding is pronounced, it is best to resort to something more effectual at once. The following plan may accomplish the purpose: With a speculum divulse the rectum freely, irrigate with hot water, watch for the bleeding-spot, and touch it with a drop of pure nitric acid from the point of a glass rod. Carbolic acid is commended by some for the same purpose, but is less effectual than nitric acid. The point of the actual cautery (Paquelin) will subserve the same purpose and is often to be preferred to both. If it is deemed inexpedient to use either of the above plans, recourse must be had to the prescriptions. The following are those commonly used:

℞. Tannin, ʒj (4.0);
Cocaine, gr. iij (0.15);
Cocoa butter, q. s.
M. et ft. suppositoria xij.
Sig. Insert one morning and night.

Or,

℞. Ferri subsulphatis, gr. xij (0.8);
Cocaine, gr. viij (0.5);
Vaseline, ℥j (30.0).—M.
Sig. Apply to the protruded parts.

Or the ferri subsulphatis can be used in a suppository, and it will be found to be of much greater efficacy than tannin.

If the hæmorrhage should not yield to the ordinary means, the following plan will be found to be a most excellent one in arresting hæmorrhage from internal piles, especially of the capillary variety: Have the rectum well washed out with hot water; dilate with a speculum, and place in the rectum over the bleeding surface of the piles

a small pad of gauze which has been freely moistened with Monsell's solution diluted with an equal part of water; withdraw the speculum and allow the pad to remain in for forty-eight hours. In the vast majority of instances it will be found that this procedure will effectually stop all bleeding. Mr. Allingham recommends the injection into the bowel of hamamelis twice a day in these cases.

When the "palliative treatment" of piles is spoken of, reference is made to the incipient stage of the disease, for after a well-defined pathological change has taken place, which constitutes the tumor of the arterial or venous pile, no palliative treatment will effect a cure. If hæmorrhage should be a prominent symptom in even these two last-named varieties, the same plan or plans of treatment as recommended for the capillary variety can be practised with success. In all such cases, however, an operation will be found necessary to effect a cure. Nothing less amounts to anything but temporizing or palliation.

Operative or Radical Treatment.

After an operation is decided on, there are many plans or methods suggested, viz.:

1. Excision.
2. Ligature.
3. Clamp and cautery.
4. Dilatation of the sphincter muscles.
5. Galvanic cautery wire.
6. The use of acids and pastes.
7. The injection of carbolic acid, etc.
8. Whitehead's operation.

Several more plans might be named, but this list is quite sufficient to select from.

1. **Excision.**—It cannot be denied that the first-mentioned plan, excision, would be an ideal one if left to the expert to perform. Reference is not made here to the plan of excision as practised by Mr. Whitehead, but to the simple excision of the tumor itself. For the reason that it is tedious and accompanied by a good deal of hæmorrhage, it is not often performed.

2. **Ligature.**—It cannot be gainsaid that the consensus of opinion is in favor of the operation by ligature for internal piles. It is the easiest of execution, the freest from danger, and the most radical in its results of all methods. It is the plan so highly recommended by Mr. Allingham and his confrères at St. Mark's, and it is the plan most frequently practised by American surgeons.

3. **Clamp and Cautery.**—There are some surgeons in Europe and a few in this country who prefer the clamp and cautery plan in ope-

rating for hæmorrhoids. The writer has employed it a number of times, but is forced to say that in his opinion it is not comparable to the ligature. The fact alone that bleeding might occur from the cauterized wound, which could not occur after a pile is ligated, is enough to condemn it. Mr. Allingham thus disposes of this plan of treatment: "This operation has little to recommend it. As regards danger to life—after all, the issue of the greatest moment—as far as our most careful researches have led us to a conclusion, it is quite six times as fatal as the ligature properly and dexterously applied."

4. **Dilatation of the Sphincter Muscles.**—Upon a false premise as to the pathological change which goes to make up the hæmorrhoidal condition, the French have advised the dilatation of the sphincter muscles as a means of cure for piles. It is not reasonable to suppose that a tumor made up almost entirely of hypertrophic vessels, a stroma of cell-growth, and abundant connective tissue could be dissipated by divulsing the muscle.

5. **Galvanic Cautery Wire.**—There was a time when the galvanic cautery wire plan of treating internal piles was much favored. It has fallen, however, into disuse and is supplanted by other and better plans.

6. **The Use of Acids and Pastes.**—Attention has been called to the fact that in bleeding capillary piles it is quite a good plan to apply fuming nitric acid to the granular surface of the pile. If this method had been limited to this class of patients, it would have proved to be of much service; but its application was extended to larger growths, and much damage resulted. It is very seldom used, and is limited to the kind of case indicated above. Pastes are of but little service and often do harm.

7. **The Injection of Carbolic Acid.**—So much has been written about this agent in the treatment of internal piles that the writer will not take the space to discuss it; sufficient to say that years ago he pointed out the dangers to be apprehended in its use. In referring to the writer's opinion Mr. Allingham says, in his most excellent book on *Diseases of the Rectum:* "For our own part, we agree with the opinion of Dr. Mathews. We have tried the injection plan in many cases, but there was generally much pain, more inflammation than was desirable, a lengthy treatment, and the result doubtful—*certainly not a radical cure.*" Dr. Edmund Andrews, a distinguished surgeon of Chicago, reports the following accidents which occurred out of 3304 cases collected: "Deaths, 13; embolism of liver, 8; sudden and dangerous prostration, 1; abscess of liver, 1; dangerous hæmorrhage, 10; permanent impotence, 1; stricture of the rectum, 2; violent pain, 83; carbolic acid poisoning, 1; severe inflammation, 10; sloughing and other accidents, 35." The writer desires to add

that in his practice he has seen a number of cases where stricture of the rectum resulted from this treatment, more than a score of abscesses and fistulæ, and other conditions equally bad. The consensus of opinion is that it is a dangerous and needless plan for treating hæmorrhoids.

8. **Whitehead's Operation.**—Several years ago Mr. Whitehead of England proposed a new operation for piles: it is, practically, to dissect out what he is pleased to call the whole "pile-bearing area." This necessitates the removal of about two inches of the lower rectum, then bringing down the gut and attaching it to the true skin. This operation has never found much favor with American surgeons. The following objections can be urged against it:

1. It cannot be advised except in selected cases.
2. An anæsthetic is necessary in every case.
3. Full and complete paralysis of the sphincter muscles is necessary to do the operation.
4. The operation is difficult, tedious, and bloody.
5. If union does not take place by first intention pus accumulates and invites sepsis.
6. The author recommends that the whole of the hæmorrhoidal plexus be excised, which is not necessary to effect a cure.
7. It can be maintained that secondary hæmorrhage is likely to occur after this operation, and the results given by the author do not justify his claims.
8. In a word, it is too much surgery when a simpler plan will result in a perfect cure.

It will be seen that the writer believes the ligature to be the best plan of treatment for internal piles. The special points to be observed during this operation are: Free divulsion of the sphincter muscle; thorough irrigation of the rectum, through a speculum, with a mercuric solution of 1:5000; dressing the tumor well down with volsella forceps; the ligature to be applied tightly at the base; the incision made in the true skin, and carried fully up the length of the tumor; and the hæmorrhoid cut off close to but at a safe distance from the ligature; antiseptic precautions before dressing, and antiseptic dressings after the operation.

FISTULA IN ANO.

As far as surgery goes, the treatment of Fistula in Ano is much more important than the treatment of hæmorrhoids. The disease, too, is of much more significance. Hæmorrhoids constitute a local

affection, but fistulæ in this region may be due to a constitutional cause. Hæmorrhoids very seldom affect the general health—except, perhaps, by bleeding, while fistula may so undermine the constitution as to seriously impair the natural vigor. All surgeons who have operated often for fistula are aware of the fact that it requires the most precise and delicate surgery to cure a complicated case of fistula in ano.

Varieties.—Almost all authors divide fistula in ano into the following varieties: *external*, *internal*, and *complete*—meaning by the external variety one that has an external but no internal opening; by the internal variety, one that has an internal but no external opening; and by complete, a fistula which has both an external and an internal opening. To the writer's mind this division is both misleading and inaccurate. By such classification no adequate knowledge can be had of the extent of the disease or of the amount of surgery which it will require to cure it. A patient may be present with a fistula which has the most insignificant external opening, and yet when the operation is performed it will be found that great destruction of tissue has taken place. A fistula may be *complete*, and be only a simple channel from the outside to the inside of the lower margin of the gut.

A much more significant division of fistulæ would be: *progressive*, *non-progressive*, and *complicated*. Such a one would at least signify some idea of the pathological changes that had taken place, and indicate to the surgeon what he might expect in the way of an operation. Not only this, but some idea could be gained as to the necessity for operation, and whether it was imperative or not. Many times patients consult a physician for rectal disease and it is ascertained by examination that it is a case of fistula, but—what kind of fistula? It may be that the patient can ill afford to have an operation done at the time of consultation, and it is the physician's duty to say whether procrastination can be practised. To say that it is an *external*, or *internal*, or *complete* fistula would signify but little, but if he saw from unmistakable evidences that the disease was rapidly progressing, that other parts were being invaded, and that local destruction was threatened, he would advise that an immediate operation be done. If, on the other hand, it was observed that the fistula was a small affair, and was *non-progressive*, he could safely say that the operation could be deferred. If it was *complicated*—for instance, if inroads had been made into other organs, such as the vagina, bladder, labia, penis, etc. —a better idea would be had as to what operation or operations should be done.

As has been intimated, fistula in ano may be a very simple affair or it may be a grave disease. It has been the misfortune of the writer to see a number of cases that were inoperable because of the

vast destruction of tissue, and invasion of contiguous organs. Some fistulæ in ano are so rapidly *progressive* that delay is fatal, in so far at least as all future comfort is concerned. The guide in estimating the progressive nature of the disease is the amount of pus discharged. It may be, too, that much of it is confined, and having no external exit makes inroads by burrowing to internal structures. If there is not much suppuration it is safe to conclude that the channels are lined by the so-called "pyogenic" membrane, which prevents invasion of other parts. It must be remembered that pus is not a secretion, but that its presence betokens danger. Sometimes the term fistula in ano is a misnomer, for very few fistulæ in this region relate to the anus at all; many of them communicate with the rectum, and some fistulæ in this neighborhood affect neither anus nor rectum. The buttock may be extensively invaded, the perineum destroyed, or a sinus run high up the back or to the thigh-joint, and have no connection with the rectum. Hence in such cases as these the instruction of the authors, "to push a director through the sinus until it is felt in the rectum, then pull the distal end out of the anus, and divide all the tissue thereon," will not obtain.

Great stress is laid upon the importance of finding the internal opening of a fistula, before operating: so far has this fallacy extended that surgeons have been known not to operate in a bad case of fistula, because "the internal opening could not be found." This idea was founded upon a false premise, and should not be heeded at all. After the main cut for fistula is made it is an easy matter to trace the channel to an internal opening, if one exists. If the opening is not definitely located, the probe or grooved director is carried beyond it, and it would be included in the cut. Granting that it might escape the knife, the lymph thrown out as the result of the operation will be sufficient to close it.

Abscess.—It is a recognized fact that all fistulæ in ano begin with an abscess. Indeed, if physicians would remember this and treat the abscess in the proper manner the percentage of fistulæ would be wonderfully reduced. It is an aphorism in surgery that just as soon as pus is detected it should be evacuated, yet it is a strange truth that many physicians when they meet with abscesses around the rectum will advise the patient to "allow it to break" of its own accord. This would have been poor surgery many decades ago, but in this day of antiseptic surgery it is inexcusable. Around the rectum is a rich field for sepsis, securing as it does an abundant blood-supply, and a free distribution of lymphatics. No abscess should be allowed to go an hour without complete opening and free drainage; especially is this true of abscesses around the rectum, which are followed in such a heavy percentage of cases by fistula.

Although it is a recognized fact that abscess in this region generally ends in fistula, it has been a point for discussion why it should be so. Many account for the fact by the statement that the circulation here is feeble, because of the absence of valves. A factor of great importance is that the tissues are soft, and often flabby, and are unable to offer great resistance to the inflammatory process, and constitute poor ground for repair. Besides, it must be remembered that certain diatheses or cachexias render these tissues peculiarly susceptible to the destructive process of inflammation. But even in a healthy condition the inroads from the inflammatory deposit are often such as to make an active and destructive condition which unless heeded at once ends in a serious complication of affairs.

The injunction to open the abscess around the rectum early and *sufficiently* is of paramount importance, and the second, to secure thorough drainage, is of nearly equal importance. It will often be necessary to give the patient chloroform to accomplish this.

Causes.—In speaking of or considering the causes of fistula in ano, the question really is, What is the *cause* of the abscess which invariably precedes the trouble? Fistula, in fact, is but the sequel and the abscess the real cause. As has been mentioned, the enfeebled circulation caused by deficiency of valves plays a part, no doubt, in the formation of abscesses in this locality, and the same reason may be productive of changes which prevent the healing of the same, hence giving rise to fistula. In a paper read by the writer some years ago, before the American Medical Association, on the subject of fistula in ano, he ascribed to the contraction of the sphincter muscle a power to prevent the healing process of an abscess contiguous to the rectum or anus, and suggested that in opening these abscesses it would be a good idea to freely dilate or paralyze the muscle.

Amongst the many causes which tend to produce fistula may be mentioned trauma, foreign bodies in the rectum, irritation from diarrhœa or dysentery, pressure of the child's head during labor, impressions made by extreme cold, etc. But it must not be forgotten that special diatheses play a great part. The tubercular subject is especially liable to abscesses around the rectum. It is not intended to convey the idea that these are, pathologically, true abscesses, yet the condition ends in fistula, and that is the disease under consideration. How to deal with such a condition will be considered under a separate head. In a word, fistula is caused by an abscess, and an abscess is caused by the germ of suppuration.

Symptoms and Diagnosis.

Fistula in ano is easily diagnosticated, for in remembering its pathology search is at once made for the sinus or the physical signs

of it. The symptoms of an abscess, which is the initial stage of fistula, are very decided, especially if of the acute variety. All the symptoms of inflammation are usually present, great pain, redness, heat, swelling, and tension. The appellation "cold abscess" is a misnomer and should never be used. All such are of *tubercular* origin. It is well to remember that fistulæ are oftentimes secondary to, and caused by, an ulceration, or ulceration and stricture, of the rectum. In all such cases, of course, the primary disease must be treated first. After the abscess is lanced or broken, in a certain percentage of cases no fistulæ will follow, but in quite a heavy percentage it will result. The first symptom that the patient will notice is a discharge from the sinus or opening which he has detected. In the female, especially, it will be the soiling of the linen that has attracted attention. It will be imagined by the patient that the "old disease" has returned, and censure of the physician will likely follow, for not having cured the abscess. It is well, whenever an abscess around the rectum is treated, to warn the patient that fistula may result. If it does not the physician gets the credit of curing the disease, and if fistula should follow he is fortified by a good prognosis.

When the patient has explained his symptoms, an examination should at once be made. An ocular inspection of the parts will reveal a good deal. If an external fistula exists, it can be seen, and if no external opening can be detected it may be that it has but recently closed. Sometimes the patient will give the history of the sinus "weeping" for a time and then ceasing to do so. This is accounted for by the fact that the external sinus closes and reopens. If this is the condition of affairs, or if there is no external opening, a closer scrutiny of the parts should be made. It will then likely be discovered that the pus discharges from the rectum. If a history of abscess has been given it is now safe to conclude that an *internal* fistula exists. In such a case the finger should be inserted into the rectum and perhaps the opening can be found. If not, by the use of a speculum and a good light the oozing of the pus from a certain point will indicate the internal opening. In either of the varieties of fistula, a "cord" can be felt and traced by pressing gently over the surface externally. This is the channel, and the course can often be made out by touch. By taking a probe and inserting it into the external opening and allowing it to find its way with only gentle pressure, it can sometimes be determined whether it is complete or incomplete. In this, however, the physician is often misled, for the channel may be complete but is so tortuous as to baffle any effort at the introduction of the probe. What has been said in regard to the useless attempt to locate the internal opening can be made to

apply to the effort to determine the course of the sinus, or the number of sinuses. This will be determined during the operation.

By the majority of physicians, fistula in ano is regarded as a simple affair, and it is expected that the disease will be found always as one of the three divisions mentioned in the books. So great is the diversity of character of fistula that no accurate description can be given of this disease except in a general way.

Tubercular Fistula.—Time was when it was believed, nearly universally, that to operate upon a tubercular patient for fistula in ano was grossly improper. Even more—that to operate upon the *healthy* subject for the disease was wrong. The idea prevailed that there was such intimacy between the lungs and rectum that if the discharge from fistula ceased, whether by operation or otherwise, it would "go to the lungs." Many people to-day hold to this old theory, and it is not uncommon for patients to ask the question, "If I have my fistula cured, won't I have consumption?" In the light of modern investigation one might say, "If you do *not* have your fistula cured you may have consumption." Tissue everywhere is likely to take on tubercular change. There is no exception to the rule from the top of the head to the sole of the feet. Tubercular disease in its various phases may be seen and recognized in any general hospital affecting the scalp, the bones, the joints, the tissues, the muscles, etc. The neighborhood of the rectum is not an exception, but on the contrary is frequently the seat of tubercular deposit. It is well recognized to-day that tuberculosis may be a local disease, from which the general constitution may become infected. Hence it is that when this local condition is detected, the surgeon immediately attempts to prevent further invasion by removing the affected part. If it is a knee-joint it is excised; if bone, it is removed or scraped; if the rectum, in the form of fistula or ulceration, it should either be curetted or trimmed out.

The diagnosis of a tubercular fistula is comparatively easy. The opening is large and flabby, allowing the finger to enter oftentimes with ease. The tissues surrounding are pale, the blood-distribution very feeble—to such an extent that when the tissues are divided very little bleeding occurs. In addition to the physical signs a specimen should be subjected to the microscope for the detection of the tubercle bacilli. It is true that in many cases the bacillus is not found when the disease actually exists, yet if it is observed it aids in the diagnosis. Other signs which can be noticed are: the sphincter muscle is weak, the tissures around the opening are undermined, the edges of skin around the opening blue and pale.

In regard to operating upon a phthisical patient who has fistula, there are just a few points to be considered: If it is a case of rapid

phthisis, and the patient has but a short time to live, no surgeon would think of adding additional pain and inconvenience by operating upon any fistula that might exist. But these cases are the exception, for, admitting that one has phthisis, its progress may be very slow indeed, and many subjects of the disease are cured. If such an one has a fistula in ano, which is giving him great distress, it would be foolish not to give him relief. But fistula in ano, tubercular in character, may exist and be purely local, and by remaining the disease may become general. By removing the local foci we get rid of the germ of infection. The writer has seen a number of cases of tuberculous fistulæ, with ugly ragged, edges, overlapping an ulcerated surface, perhaps just at the verge of the anus, embracing the fibres of the sphincter muscle and causing great pain. He has been gratified in such cases by seeing all distress abated after operation.

In the patient who has fistula complicated with phthisis, if an operation is done he should not be kept in bed, but should get about again in the shortest time possible. The recumbent position excites to coughing and thus militates against the healing process. It is much the best to assist him to walk out in the open air, even if a large wound exists. These patients should be fed on good nutritious diet all the time. The old impression that the wound would not heal in the tubercular patient is fanciful, for oftentimes the most beautiful results are obtained. Many patients complain much more of their fistula than of their lungs, and to these great relief comes not only physically but mentally as well. The writer cannot concur in the opinion expressed by some authors, that as long as the fistula is insignificant and discharges but little, it should be left alone. The question in such a case to determine is whether the fistula is of tubercular origin: if so it should be removed; if not it could be left alone.

Operative Treatment.

There is but little palliative treatment for fistula. In the great majority of cases nothing but an operation will effect a cure. The abscess, which is but the forerunner of fistula, can be palliated, so far as the pain is concerned, by the application of heat, etc., but even here it is much the best plan to resort to surgery by lancing it freely. In regard to operating for fistula it should be first determined what kind of fistula exists. As has already been intimated, the opening, either external or internal, betrays but little as to the extent of the disease. The injunction to divide the tissue upon the director will hold good only in those cases where the track is single—not complicated by diverging sinuses. It would be a most difficult matter to say just what amount of surgery would have to be done in any single case. Indeed, very few cases of fistula are alike.

As to the methods they can be included under the following heads: (1) Injections; (2) Elastic ligature; (3) The knife.

Injections.—Patients, as a rule, are very averse to the use of the knife, especially in rectal affections. This antipathy has been brought about by the advertising charlatan, who proclaims a cure for all such affections without the use of the knife. Of course this is the veriest nonsense, yet many are enticed into their care by such representations, or rather misrepresentations. Can fistula in ano be cured without surgical means? The question must be answered in the negative in so far as the majority of cases are concerned. Some of the older writers mentioned the plan of injecting the fistulous sinus with some agent which would excite to the granulatory process, and by this means close the channel. It was, therefore, suggested to inject into the opening, by means of a small syringe, iodine, solution of silver nitrate, diluted acids, etc. This plan is still vigorously followed by some quacks in order to bear out the assertion that the knife is not used. To say that this manner of treating fistula is of but little account is putting it mildly, for instead of benefiting it would very often be productive of harm. No gauge can be set upon the amount of the caustic that is used, and violent inflammatory action might be excited, sufficient to cause an abscess and thereby add to the trouble. It is true that the external opening may sometimes be closed by the use of such agents, but that is just what is not desirable. By so doing pus would be confined and additional sinuses would form. It can be definitely said that the effect of all such methods is conducive of harm rather than good.

Elastic Ligature.—It was Professor Dittel, of Vienna, who first suggested the use of the elastic ligature for the cure of fistula. Had the professor lived in this day of aseptic surgery it is to be doubted if he would have made the suggestion. Certainly it cannot be claimed for the operation that it is aseptic, and that is what is most desired now in all surgical operations. The method consists in putting an elastic cord through the external opening, catching it in the rectum, pulling it out of the anus, and running a piece of lead with a hole cut in its centre over the two ends and tightening sufficiently to cut out. Many devices have been suggested for doing this, but the writer has found the simplest and best to be a grooved director with an eyelet, or hole, through the end of which the cord is passed. The objections to this plan suggested by Prof. Dittel are manifold:

(1) It is unsurgical. From all fistulous sinuses pus exudes, and the introduction of a foreign substance (the ligature) excites to an increase of it. It is impossible to irrigate the channel or apply any antiseptic to it during the progress of the cutting by the cord.

(2) There is no means of telling whether the sinus is a simple one

or not, and in the majority of cases there are diverging tracks. It must be conceded, then, that each individual sinus must be treated in like manner, which would prolong the cure indefinitely. What it would take the ligature, therefore, weeks to accomplish, the knife could do in a few minutes.

(3) It is painful and annoying. Some writers have claimed that very little or no pain accompanies this plan. It is not reasonable to suppose that several inches of tissue embracing the sphincter muscle could be cut through without pain, and this has not been the experience of the writer. Add to this that the discharge is continually soiling the linen, and it can easily be seen that it is anything but comforting.

The Knife.—It must be firmly impressed that fistula in ano is often a most serious surgical affection, and that it requires in many cases desperate surgery to effect a cure. It is no uncommon thing to find as many as twenty or more different sinuses leading to important structures and of great length. For practical use the external sphincter muscle is the most important in the body, and this is to be dealt with in any and all operations for fistula in ano. True, many of these cases are simple ones and require but little attention, but it must be borne in mind that these are the exception. The surgeon who believes that he can always cure fistula in ano by one single operation will find himself greatly deceived. In the first place it may not be desirable to complete the operation at one sitting, because of the damage which would be done to the sphincter. Secondly, however careful he may be, an undiscovered sinus may exist and prevent the operation's being successful. A patient might forgive an unsuccessful attempt at cure, but would never forgive being left in such a condition after the operation that he could not control the actions from his bowel.

The first step to the operation by the knife is to have the parts in as nearly an aseptic condition as possible. It may be urged that this is impossible, for the reason that we are dealing with a pus-disease. But it must be remembered that fresh wounds are to be made, and that the rectum is a favored spot for sepsis. Again, the office of the rectum—to receive the fæces—makes it a difficult part to be thoroughly cleansed and to be kept so. Notwithstanding these facts every precaution should be taken in order to do just as clean an operation as possible. Irrigations with mercuric solution and the use of iodoform dressings should not be neglected in any operation for fistula.

The principal advantages that the knife has over every other method of operating for fistulæ are: Every sinus can be sought out and divided; overlapping edges can be trimmed away; the operation is done quickly; and the wound can be dressed antiseptically.

The chief admonition for operating for fistula is to lay freely open

every sinus, or the result will be a failure. It might be presumed that by plastic deposit an additional sinus would be obliterated, but experience teaches to the contrary. These channels are lined by a tough, elastic membrane which resists the healing property of the inflammatory product.

Compared with all other methods practised for the cure of fistula in ano, the knife is the most surgical, most efficient, and the best.

STRICTURE OF THE RECTUM.

STRICTURE of the Rectum is one of the most serious conditions met with in that portion of the gut. It can be safely asserted that when caused by other than benign conditions it is incurable save by radical means, and then seldom so. The following is the usual classification: 1. Acquired; 2. Spasm; 3. Dysenteric; 4. Tubercular; 5. Inflammatory; 6. Traumatic; 7. Venereal or Syphilitic; 8. Malignant.

The first term used, ACQUIRED, is, to say the least of it, a very vague one. One can imagine how a stricture the result of venery could be acquired, but it would be difficult to conjecture how a spasmodic or cancerous stricture could be acquired. If such a classification is given it would be best to include it in a *congenital* variety.

SPASM.—If a stricture of the rectum ever really exists from spasm it should not be classified, because no pathological change exists. It would be only a symptom of disease elsewhere. Again, it seems impossible for the lumen of the rectum to be so materially affected by spasm as to constitute, or resemble, a stricture.

DYSENTERIC.—Dysentery is regarded as a frequent cause of stricture of the rectum. The writer, after a long experience in rectal surgery, cannot agree that it is so. Very many cases present themselves with symptoms of dysentery that have stricture, but upon investigation it will be ascertained that the dysentery (?) is the result of and not the cause of stricture. The process of ulceration after dysentery is not usually observed in the rectum, but in the colon, and it is here that the contraction would take place. Surgeon-General Woodward writes that he had carefully searched the Pension Office for the record of a case where a pension was drawn for the existence of a stricture of the rectum the result of dysentery contracted during the war, but could not find a single one. Certainly dysentery is not a *common* cause of stricture of the rectum.

TUBERCULAR.—As has been affirmed, the tissues around the rectum are often the seat of tubercular change, ulceration, etc., but it is quite another question whether stricture often results from this cause.

The nature of tubercular tissue is to break down, and it would appear that in the capacious rectum this change would take place before the gut was constricted.

INFLAMMATORY.—The term inflammatory is so broad and comprehensive that per force of reason it must be admitted that it is a common cause of stricture. May it not be asked if it is not the *only* cause of stricture? It would be difficult to understand how a stricture could be formed—this being always by deposit—without the process of inflammation going on. It matters little what the variety—trauma, pressure, dysentery, cancer, tuberculosis, syphilis, or what not—this suggestion obtains. Even a simple cicatrix, which would contract the gut, could not exist save by inflammation. Proctitis is nothing save an inflammation of the walls of the rectum, and it should not be said that a stricture is the result of proctitis, but that proctitis is the result of inflammatory deposit. What excites to this proctitis is another matter, and sometimes difficult to tell.

TRAUMATISM.—Under the head of traumatism it is common to name ulcerations following operations or wounds above the rectum. Of course traumatism excites to inflammation, and inflammation to a deposit, and the deposit to contraction—hence stricture. But, after all, this is inflammatory, and the pathology is found in this process.

VENEREAL.—Under the head of venery, as a cause of stricture of the rectum, three conditions are mentioned: chancroidal, secondary, and tertiary ulcerations. Fournier describes an unusual form as resulting from a gummatous deposit. It is certainly not shown that stricture of the rectum is due to the extension of chancrous pus, nor that it results from unnatural intercourse. The writer in his book on diseases of the rectum [1] attributes 60 per cent. of the strictures of the rectum to syphilis. Not in the way of chancrous extension, or unnatural intercourse, but to changes which take place the result of cell-proliferation—an "anal-rectal syphiloma." Further experience has not changed his opinion, but confirmed it.

MALIGNANT.—In all cases of cancer of the rectum stricture will be detected at a certain stage. The hyperplasia, gradually increasing, infringes on the walls of the gut and narrowing takes place. It is very seldom that a physician sees a case of cancer of the rectum until a decided contraction has taken place.

SYMPTOMS AND DIAGNOSIS.

The symptoms of stricture of the rectum are very insidious indeed. It is a remarkable fact that strictures often exist which would not permit the entrance of a lead pencil, and yet no special symptom is complained of except constipation; this is especially true of the

[1] *Diseases of the Rectum, Anus, and Sigmoid Flexure.*

syphilitic form of stricture. If, however, the passages are observed a discharge can be seen which is either mucus or pus, or is mucopurulent, and sometimes a slight amount of blood. Pain is not often a factor in the venereal stricture, and the same may be said of strictures from benign causes the result of simple inflammation. In cases of stricture the result of cancer the reverse is often true, the pain being very severe—sometimes constant, sometimes exacerbating. If the malignant growth is well above the sphincter, it will be observed that pain is not nearly so severe as when situated within the grasp of the muscle.

The only correct way to properly diagnosticate a stricture of the rectum is to introduce the finger. If within reach it is easily detected, and in the vast majority of cases strictures are within reach of the finger. The clinical history of the case must reveal the character of stricture. Sometimes the microscope can be used to advantage.

Treatment.

There are numerous plans recommended for the treatment of stricture of the rectum. They can be summed up in these: 1. Dilatation (gradual or forcible); 2. Incision; 3. Electrolysis and Raclage; 4. Excision; 5. Colotomy.

Dilatation.—Although recommended by many, *gradual* dilatation will be found less serviceable than *forcible*. The chief advantage in the latter is that the stricture can be broken to the full capacity of the gut in one sitting, while with gradual dilatation it would require months to accomplish this much.

When it is remembered that stricture of the rectum is located nearly invariably within three and one-half inches of the outlet, it can be readily seen that the danger in forcible dilatation is nearly *nil*. When gradual dilatation is practised, constant irritation is kept up, which favors plasma, and if the process is left off a little time, recontraction occurs. If a stricture is located high up in the rectum—in the movable gut—it is dangerous to attempt dilatation by any method.

Incision.—In certain forms of stricture the incision plan is to be highly recommended. There are two methods, called respectively *internal* and *external* proctotomy. The internal is, in the writer's opinion, to be preferred. It is urged for the external that it is best in order to get proper drainage. Even if this were true the ill effects of a complete division of the sphincter muscles would outweigh the objection. Internal proctotomy is not dangerous when properly performed; and the writer has never had periproctitis follow after practising it. Of course antiseptic precautions are to be followed as strictly as possible.

Electrolysis.—The method of treating stricture of the rectum by electrolysis has not met with great favor in the United States, but is advocated with great earnestness by a few. By its advocates the following advantages are claimed:

(1) That electrolysis in the treatment of stricture is not a panacea; on the contrary, failures may happen and will irretrievably fail if the stricture is due to carcinoma.

(2) Electrolysis will give improvement when all other methods fail.

(3) Electrolysis will cure a certain percentage of cases without relapse, and without the necessity of an after-treatment or the use of bougies.

(4) The best chances for a cure are with fibrous inflammatory strictures.

Excision.—To the surgical mind, excision of a stricture sounds ideal, yet there are many things to be considered before it would be attempted. First, the etiology of the stricture must be defined before the plan of treatment is adopted. Where a simple fibrous band is stretching partly around the lumen of the gut, the simplest thing would be to divide it. If it is of tubercular origin, it would be impracticable to excise it; and if it be a stricture caused by either syphilis or cancer, the operation would amount to an extirpation. It must also be considered that to excise a stricture, the sphincter muscle must be involved in the operation, and the results must be anticipated. Extirpation will be considered under the head of Treatment of Cancer.

Bacon has devised a plan by making a new channel around the stricture by folding the gut above the constricted portion down over the stricture and anastomosing it with the rectum below the contraction, afterward clamping away the septum that has formed.

Colotomy.—Whatever might be the nature or cause of stricture, the strongest advocates of colotomy could not plausibly advocate it as long as the patient could have a moderately free evacuation from the bowels, and there was no danger from hæmorrhage. Pain is rarely so excessive, even in cancer of the rectum, as to justify colotomy, especially if the bowels move freely. If the question of colotomy is upon the propriety of operating for stricture *per se*, it might be answered that where total or nearly total obstruction exists and the stricture is in the movable gut, beyond the reach of the finger, colotomy is advisable. Stricture the result of syphilis is an ideal condition for this operation when located as herein stated.

CANCER OF THE RECTUM.

Of all affections of the rectum, cancer is the most serious. Unfortunately, too, it is scarcely ever met in its incipiency, and the chance for a cure is lost, or at least is a minimum.

The medical world is still in the dark in regard to the cause of cancer, in the rectum or elsewhere. Many pages have been written in advocacy of the position that the disease is hereditary, and others are equally of the opinion that heredity plays no part. It is believed that a long-continued local irritation is conducive to malignancy. Future investigations may upset all theories of the present in regard to the cause of cancer. The consensus of opinion is that age plays a part in the development of the disease, it being said that middle life is the favorite time, then advanced age. The writer has reported several cases in patients under seventeen years of age. Women are said to be more liable to cancer than men. This may be true so far as the body as a whole is concerned, but there can be no reason why they should be more exempt from cancer of the rectum.

It is not the intention of the writer in this short space to enter into a discussion of all the classifications of cancer of the rectum, or to go into a debate on its nomenclature, but rather to mention only the practical points. For all purposes the term *adeno-carcinoma* is quite sufficient, for the other varieties can really be included under this head, pathologically and microscopically. A further classification would also divide *adeno-carcinoma,* which would be confusing and be of no practical utility. These fine points can be decided after the removal of the growth rather than before.

Symptoms and Diagnosis.

Cancer of the rectum is a most insidious disease, often in its incipiency presenting no symptoms worth mentioning. It is only after the growth has existed for some time that any positive evidences of cancer are given. Among such signs may be mentioned the pale and waxen aspect, the peculiar odor, disposition to bleed, frequent stools, muco-purulent discharge, etc. Pain sometimes is intense, and at others not sufficient to be called a factor, and when it does exist there is generally violent straining at stool, which is distressing.

Treatment.

It might be said that as regards treatment of cancer of the rectum the reverse of an axiom in surgery would obtain. Ordinarily in diseases requiring extirpation it is advisable to wait for the full development of the disease, and to use palliative measures until it does mature. In cancer an operation would be advisable during the

incipiency of the disease, and palliative measures discarded. But the affection being so slow to manifest itself, all chance to operate has passed when the diagnosis is made, and nothing is left but to palliate.

If the cancerous mass protrudes from the anus, a free application of powdered burnt alum will have the effect of reducing it. Another excellent application is arsenite of copper with mucilage, as a paste. After all, what the patient desires in the way of palliation is relief from pain, and of all the remedies to accomplish this opium in some one of its forms is the best. The writer can see no objection to prescribing this drug freely, where the case has been decided to be an inoperable one. If the life of such an unfortunate can be made in any way comfortable by the use of opium, he should have it. Some other things should be looked after, such as diet, position, and especially the keeping of the parts free of débris, by frequent irrigation with antiseptic solutions. If a close stricture is within reach, and is obstructing the passage-way it should be divided, and sometimes a free curettement will do good by relieving nerve-pressure.

Operation.—The writer is on record as opposing either one of the operations for cancer, *excision* and *colotomy*, except in the rarest of cases. If the cancerous patient can have his actions in a moderate degree of comfort, and there is no risk of life from hæmorrhage, there could be no logical reasons for doing a colotomy. If pain is urged as a reason for the operation, it could be answered that much could be done for the relief of pain by doing one of the minor operations. It must be admitted, even by the most vehement advocates of colotomy, that the operation is really nothing less than a palliative means. The diseased structure is left to go on with its ravages without any hope of cure. The operation is not a pleasant one to contemplate, to say the least of it, and though it may and does relieve pain in some cases, in many others it fails to do so. Then it might be urged that opium would accomplish this without an operation.

As to excision of cancer, as has already been said, it is the ideal method of treatment *provided* that the whole cancerous mass can be enucleated. But the question is, Can this be done? Surgeons of much experience in dealing with cancer of the rectum say that this can rarely be accomplished. The rectum is so abundantly supplied with blood-vessels and lymphatics, that it forms a suitable bed for absorbing and propagating the cancerous material, that by the time the surgeon sees the case, contiguous organs have been involved and gland-infiltration has taken place.

Of what avail is it to remove a portion of the rectum, when the whole of it is involved? What is accomplished if the whole is removed, if other organs are implicated. There must be a line drawn—outside of the age of the patient, physical conditions, etc.

The matter should be settled whether really there is any chance of cure, before submitting a patient to either of these radical procedures. Of course, if by colotomy life can be saved, or great pain relieved, the operation would be warranted; or if by excision the whole mass could be removed and leave other organs unaffected, it would be justifiable.

PROLAPSE OF THE RECTUM.

In the adult, prolapse of the rectum is infrequent, but it is often met with in children. Prolapsed hæmorrhoids are sometimes mistaken for true prolapse of the bowel, and oftentimes there is some prolapsus with an aggravated case of piles. Then, too, there is a vast difference in the character of prolapse. In one variety only the mucous membrane is involved, while in another all the coats of the bowel, and often the peritoneum, help to constitute it. In forming an opinion as to which variety exists, the size and the history play a part, and taxis will reveal a good deal to the expert surgeon. The mucous-membrane variety signifies no danger either in treatment or otherwise, but in dealing with the second variety danger is to be apprehended.

Symptoms and Diagnosis.

The most positive symptom of prolapse is of course the protrusion of the bowel at stool. Children not being subjects of piles, any protrusion of the bowel at stool would indicate either a polypus or prolapse. In the adult this protrusion should be carefully inspected in order to differentiate between hæmorrhoids and true prolapse. Straining at stool causes the nurse to observe that something is the matter, and by ocular inspiration a small red tumor is seen pushing through the anus. By taking hold of it, it can readily be told whether it is a polyp or prolapse.

Treatment.

The treatment of prolapse is both palliative and operative. In children especially, the cause should be looked after. With this class of patients the most common cause will be found to be pin-worms. Anything that excites to an irritation and violent effort at straining will produce the affection and should be sought for.

The best manner of treating prolapse of the rectum in a child is the following: Administer a dose of castor oil; after it acts give a high enema of salt water, then a dose of paregoric; apply adhesive straps across the two buttocks, bringing them firmly together. Put the child to bed for one week; on a light diet; on the fifth morning give a dose of oil. Remove straps when bowels move, which should be

in the erect position ; wash out the bowel with cold water, and keep stools gently soluble and open. In the majority of cases this plan will succeed in curing prolapse in the child, and some suggest washing the prolapsed bowel each time with some astringent, but it seldom accomplishes the purpose.

The mildest operative treatment is that suggested by Van Buren, which consists in applying the actual cautery at a dull-red heat to the tumor in stripes radiating from above downward. To do this requires the use of an anæsthetic and looks a little barbarous. The writer has never had to resort to this treatment in children, but has used it several times in the adult with moderate success. For the treatment of an old or chronic prolapse in the adult, especially in the aged, a much more radical method has to be adopted. It has been suggested to amputate the entire tumor.

It will be found that, in the aged, prolapse of the rectum does not give as much distress as one would imagine, and before deciding upon so radical a procedure as the removal of the entire tumor the surgeon should give serious thought. Many of us have seen such a "tumor" assume the proportions of a man's head, and yet the patient complain very little from its effects.

RECTAL POLYPI.

It would be quite an easy matter to mistake a rectal polyp for prolapse of the bowel, in an infant, if an examination was not made. The nurse would be apt to say in both instances that a "small red tumor" was presenting at the anus. By examining, the difference can be easily told, as the polyp has a distinct stem or pedicle, while prolapse takes in the entire circumference of the bowel. Polypi are often found in children, but it must not be supposed that they are confined to this class. In the adult these tumors sometimes are of very large size, and have a stout pedicle. They often exist at the same time with other affections of the rectum, notably piles. In searching the gut for them, the effort must be very thorough, as they often elude the finger. Whatever their size, character, or location, the only treatment is to remove them. If they can be caught, held, and ligated, this is undoubtedly the best, as this tumor is sometimes supplied with a large-sized artery. If this plan is impracticable, then the polyp should be twisted off and the case watched for hæmorrhage.

PRURITUS ANI.

One of the most distressing affections of the human body is a pronounced case of pruritus ani. Patients who suffer from it often say that they would much prefer to endure pain than to suffer from the intolerable itching. No class of people is exempt, for the rich bring it on by excesses in both eating and drinking, and the poor perhaps by other habits equally productive of it. Age has but little influence, although it is most commonly found in middle life, and it pays no respect to sex, as both the male and female suffer from it. Sometimes it exists in a very mild degree, at others it is of the most tormenting character.

Pruritus ani often appears as a distinct eczema, but more frequently nothing can be seen to indicate any pathology. Whilst pruritus may and does often affect other portions of the body, the anus is the most favored seat. When present, it is aggravated by certain articles of diet, by smoking, by drinking alcoholic liquors, by excessive venery, by eating peppers, etc., but it is doubtful if any one of these is ever the direct cause of the trouble. It is most intense when the parts are heated, hence is worse after the patient has retired for the night and has gotten warm in bed. The disposition of the affection is to localize itself, but in some instances it extends to the scrotum, buttocks, and far down the legs. If it has existed for a long time, by inspection a distinct scarf-skin can be seen—white, glistening, and very smooth. After treatment the disease will often disappear, and the patient will express himself of the conviction that he is entirely cured, but from the slightest indiscretion in diet or drink it will suddenly appear again.

Treatment.

The first thing to do in a case of pruritus is to inquire after the habits of the patient: whether he is an over-eater; indulges in alcoholic or malt liquors; is a tobacco-user; is a man about town, and indulges his sexual appetite to an abnormal amount; is a drinker of tea or coffee. Each and all of these should be interdicted before treatment is begun. It may be that some special article of diet brings on an attack, and this should be carefully investigated by the patient. Obstinate constipation may have something to do in producing or keeping up the trouble; therefore this should be corrected by the use of aperients. The following is a good laxative:

℞. Sulphur. sublimati,
Potassii bitartratis, āā. ʒiv (120.0).—M.
Sig. Teaspoonful in glass of water, before breakfast.

It is also well to look to the secretion of the kidneys, to the amount of urine passed, and the constituents of the same. When loaded with the oxalates or urates, a disposition to itch is often established. In a general way it is well to advise the patient to take frequent hot baths, especially at night before going to bed. The Russian or Turkish bath will be found of excellent utility in protracted cases of pruritus. If the patient is "run down" in health, it is all-important that he be built up; especially is this true if there is any special diathesis manifest, as syphilis, tuberculosis, etc. For these, special treatment should be accorded, such as small doses of bichloride of mercury, potassium iodide, cod-liver oil, iron, etc. In another class of patients it will be found that the nerve element plays an essential part, and the neurotic symptoms must be ameliorated. It is a difficult matter to map out any definite plan of treatment, as nearly all cases of pruritus are individual ones and must be thoroughly traced and then prescribed for.

As to local applications there are hundreds, many of which are claimed by some to be specific in their action, but which after a few trials will be thrown away by others. In cases that partake of the eczematous variety, Dr. Bulkley recommends the following:

℞. Liq. carbonis detergens (Wright's), ℥j (30.);
Glycerini, ℥j (30.);
Zinci oxidi, ℥ss (15.);
Pulvis calaminæ præp., ʒss (2.);
Aquæ, ℥vj (180.).—M.
Sig. Apply with brush and allow to dry, daily.

In this variety, also, pastes are sometimes to be preferred to solutions or ointments, such as—

℞. Hydr. chlor. mit.,
Bismuthi subnit., *āā.* ℥ss (15.).—M.
Sig. Dust on parts, or rub in with finger frequently.

One of the best of agents to stop itching is ichthyol:

℞. Vaselini, ℥j (30.);
Ichthyol., ʒj (4.).—M.
Sig. Apply.

Or,

℞. Ungt. aquæ rosæ, ℥j (30.);
Menthol., ʒj (4.).—M.
Sig. Apply morning and night.

When other remedies fail, bichloride of mercury either in solution or ointment will give good results:

℞. Vaselini, ℥j (30.);
Hydr. bichlor., gr. viij (0.52).—M.
Sig. Apply.

Suppositories, as a rule, do not accomplish much in these cases, but the writer has derived benefit from the following:

℞. Cocainæ hydrochlor., gr. iij (0.195);
Ol. theobromæ, q. s.
M. ft. in suppositoria No. vj.
Sig. Use one at bed-time.

In lieu of all ointments it will, with a certain class of these patients, be found best to use powders or dry dressings, such as calomel, bismuth subnitrate, starch, etc. In the moist variety the patient should be advised to wear a well-adapted pad of oakum against the anus. When the disease resists all such local treatment, a more radical method is the use of the galvanic cautery, curettement of the surface, the application of pure carbolic acid, tincture of iodine, or campho-phénique. It should not be forgotten that a neurotic element may predominate, and nothing will cure until this element is dissipated and the general health is built up.

FISSURE OF THE ANUS; IRRITABLE ULCER OF THE RECTUM.

A DISTINCTION should be drawn between a fissure and an irritable ulcer. Most books speak of fissure of the rectum; this is a misnomer and anatomically incorrect: a true fissure could not be formed in the *rectum*, but the anus is the common seat of such trouble. The rectum, however, is the seat of irritable ulcer, and the reason for so calling it is that the ulcer falls within the grasp of the sphincter muscle. Ulcers are often found above this muscle which are not painful in the least although of good size. A fissure is a simple crack, or break, in the mucous membrane, at the verge of the anus, caused by a tear, likely, in passing hard fæcal matter. Of course any trauma of the parts might give rise to the disorder. At first the abrasion presents acute symptoms, as a fresh wound would, but after a while the pathological changes which constitute an ulcer take place. This fissure-ulcer, therefore, is oblong in shape, while the irritable ulcer is

oval and situated higher up. Of course a fissure is irritable, but a contradistinction must be made in order to treat the affections rationally. Fissure of the anus is the most painful of all rectal diseases, except, perhaps, some cases of cancer in the same region. Indeed, many persons who suffer from fissure are firmly persuaded that they have a malignant growth. It is strange, too, that patients, especially women, will suffer the agonizing pain of fissure for years without consulting a surgeon. An ointment is used, and the disease may for a while seem cured, when suddenly after a stool the same terrible pain is experienced.

In the majority of cases of fissure, it is difficult to trace it to any definite cause. The use of printed paper as a detergent can be set down as one of the causes. Some people are in the habit of using hard and irritating substances for this purpose, as wood, splinters, corn-cobs, weeds, grass, etc. These, of course, may set up inflammatory action or cause a break in the mucous membrane which would result in fissure. The affection is common in syphilitic children. The childbearing woman is said to be a subject of fissure, though the writer has seen but few cases of fissure in the recently delivered woman.

If a polypus of the rectum exists with a pedicle sufficiently long to allow the tumor to protrude at stool, this would be a pronounced cause for fissure. It is well in all cases of fissure to examine the rectum not only for polypi, but for other things which may be the primary cause. Some authors speak of fissures resulting from surgery around the rectum, notably for hæmorrhoids, but in the writer's whole experience he has never seen such a case. Nor can he subscribe to the view expressed by some that displacement of the womb may cause the anus to become fissured. An irritable ulcer above or encroaching on the sphincter is more likely to be caused by such displacement. Straining, or pressure from hard fæcal matter, would likely produce a fissure.

Symptoms and Diagnosis.

Patients who have fissure of the anus will give the history in about these words: "It makes very little difference so far as pain is concerned, when the bowels move, for I know that in about twenty minutes I am going to suffer. It begins as a sharp, cutting, contracting pain, and increases until it seems unbearable. No position that I can assume does any good, and I have it for from two to six hours, when it gradually wears off, and I feel perfectly easy until my bowels move again." This is a common history, and the affection has by physicians been called many names, the most common of which is "piles." It can be set down as an axiom that, if much pain is suf-

fered by the patient, the disease is not piles, for piles in the quiescent state cause very little if any pain.

A fissure may be a very simple affair, only a slight tear through the mucous membrane, or it may be a very complicated and ugly condition. When due to trauma and treated early it will heal kindly, just as any other fresh wound, but if left alone it will assume the proportions of an ulcer. Fissures may be the result of a constitutional affection, as syphilis, tuberculosis, etc., and cannot be effectually cured until constitutional treatment is afforded. The latter are ugly in character, often deep and ragged, and require more surgery than is necessary for the other kinds, such as divulsion, etc.

Fissures may be single or multiple, situated dorsally or lateral, rarely in front. They can be seen generally without a speculum, by drawing down and everting the anus. To detect an irritable oval ulcer higher up, a speculum must be used. An internal opening of a fistula may be mistaken for a fissure, for when located within the grasp of the sphincter the pain is very nearly identical; therefore it will often be necessary to use a probe in making a diagnosis. If the same treatment were adopted in such a case as in fissure, the pain would soon return. Nothing should be overlooked in these cases.

Treatment.

The treatment of fissure is usually described as both palliative and operative. Taking the pathology and the excessive pain into consideration, it would appear plausible to give the patient immediate relief by doing an operation. Yet patients, as a rule, are so averse to any surgery, when anything else can be substituted, that it may be necessary to use palliative measures in cases of fissure. The writer is on record as advocating an operation in nearly every case of fissure, his reason being the rapidity with which a cure is effected in contrast with a long palliative treatment with indefinite results. The palliative treatment consists in keeping the bowels gently moved with an aperient. Any good mineral water, as Apenta Rubinat or Hathorn, will answer the purpose; keeping the parts cleansed with soap and water, and the use of local applications. The best of these is silver nitrate, either in stick or a strong solution, mildly coating the full extent of the fissure. Sulphate of copper used in the same manner will be found serviceable, or in some cases pure carbolic acid. To use any of these it will often be found necessary to employ a small bivalve speculum and to gradually stretch the rectum until the full length of the fissure is seen. For an application to the oval irritable ulcer it is always necessary to use a speculum. An application to this form of ulceration will not generally be sufficient to effect a cure. It will be found necessary to scarify the surface thoroughly, and sometimes to

trim the edges. Divulsion, too, is of great importance in order to release the spasm or grip of the sphincter muscle. Besides the remedies which have been mentioned in the palliative treatment of fissure, a number of others less severe in effect are recommended. The following is used by Mr. Allingham:

℞. Hydrarg. chlor. mitis, gr. iv (0.26);
Pulv. opii, gr. ij (0.13);
Ext. belladonnæ, gr. ij (0.13);
Ung. sambuci, ʒj (4.).—M.
Sig. To be applied frequently.

A better one, in the opinion of the writer, is—

℞. Cocainæ, gr. xij (0.78);
Menthol., gr. xv (1.);
Hydrarg. chlor. mitis, gr. xxx (2.);
Vaselini, ℥j (30.).—M.
Sig. Apply two or three times daily.

Injections, to be used just after the bowels move, will be found serviceable, and the best is: One ounce of olive oil, containing five grains of iodoform and ten drops of laudanum. Good may be accomplished by having the patient take an injection of four or five ounces of linseed oil every morning before the bowels move. The physician can use his own judgment in selecting remedies of this class, which may be equally effective with any mentioned in the books.

Operation.—The operative procedure for fissure must be made to fit the case. A recent attack may yield to the simplest of local applications or to the mildest divulsion, while others will require heroic treatment. In children suffering from fissure it will often be sufficient to have the mother or nurse, each morning, anoint the fore finger and gently insert it into the rectum. After a few times it will be noticed that the infant complains less at stool.

Where a fissure has existed for any length of time in the adult, a more severe operation must be done. It consists in a free divulsion of the sphincter, a deep incision through the fissure, and a paring of the edges of the ulcer, or a free scarification of the whole surface. Originally it was thought advisable to *break* the muscle, and many practise that method yet, but such rash treatment will not be advisable in the majority of cases.

It will be found absolutely necessary in operating for fissure or irritable ulcer to administer an anæsthetic, for the pain incident to doing this operation would be unbearable.

After doing any one of the different operations advised it will be found important to watch the patient in regard to diet, regulation of bowels, cleanliness, etc., for some time, in order that a perfect cure be obtained.

NEURALGIA AND HYSTERIA OF THE RECTUM.

Neuralgia at best is a vague term, but when applied to the rectum is most difficult of description. There are so many ways in which pain can be referred to the rectum, that it would be a plain duty to trace the cause before coming to the conclusion that such pain was neuralgia. As to the term *hysteria* of the rectum, the writer has grave doubts as to the correctness of the expression. If pain actually exists it is his expressed opinion that it must be due to a local lesion, and if the premise is correct the idea of its being hysterical is dissipated. When it is remembered that the slightest lesion, abrasion, or tear around the rectum will excite great pain and distress, it can be easily understood that many cases of the kind will appear. Then, too, the affection may be so slight that no pathology, as inflammation, etc., is discernible, and hence a diagnosis of hysteria is rapidly jumped at. The simple exposure of the filament of a nerve may be sufficient to cause acute symptoms, and yet the said filament can be detected only with difficulty. It may be possible that if a patient is on the verge of insanity he might complain of pain in his rectum, or anywhere else, which would be only imaginary, and this is given as one of the cases of hysterical rectum.

Whatever may be the nature or cause of the trouble, certain it is that it is a most difficult thing to effect a cure. Patients of this class generally shift from one physician to another, and often to the satisfaction and great relief of the one that is left.

Symptoms and Diagnosis.

The patients suffering with neuralgia of the rectum are rarely able to give well-defined and intelligent symptoms. When asked to locate the pain they hesitate, and frequently contradict themselves. Some, however, complain of a distinct *spot*, and although nothing can be discovered by the physician at the point indicated, the patient will still insist on his declaration that something must be in trouble there. The pain complained of is generally of an acute nature, simulating very much the fissure pain, although not having the distinctive feature of being connected with the act of defæcation. Sometimes the pain is constant, and proves to be a great burden, showing its effect upon the general health of the patient. Vain imaginings take possession of the

patient, and the fear is constant with him that the trouble is malignant. Women are most often the subjects of this affection, and prove to be very troublesome patients. All effort at relief oftentimes proves futile, and they become real objects of pity.

The writer is firmly convinced that neuralgia of the rectum is caused, in the vast majority of cases at least, by a pathological change somewhere; that, if it be in the rectum, a filament of nerve is exposed, and if the disease does not emanate in the rectum it is made manifest there through some one of the reflexes. There are many conditions that could cause such manifestations, such as an irritable prostate, stricture of the urethra, a sensitive ovary, a displaced womb, a diseased coccyx, or a spinal irritation. In persons given to the opium-habit will be found a disposition to complain of imaginary pains, and the rectum will not escape their attention.

Treatment.

If it could be definitely settled that any given case was due to an hysterical disposition, of course all treatment should be directed to an effort to overcome it. But such efforts will, in the main, be found utterly futile. The mind should be diverted by travel, new associations, active business, etc. Good substantial food should be provided, proper hygiene observed, the bowels regulated, and the secretions watched. The local disturbance, going upon the premise that a lesion exists, should be diligently sought for. It may be a simple filament of an exposed nerve, which if found and divided, or cauterized, will heal. If none such can be discovered, then the reflexes should be traced, and the origin may be found in some contiguous organ, as the uterus, ovaries, urethra, prostate, or possibly the coccyx. If in the latter it should be removed, or if in any one of the others they should receive proper attention.

It will be found often in cases of neuralgia of the rectum that a great amount of mucus is discharged; this is caused principally by reflex disturbance, and not from any real inflammatory condition. It is well, however, to use some mild astringent injection, as lead acetate, boric acid, fluid hydrastis, or pinus canadensis. If the pain is intense, local applications of silver nitrate, carbolic acid, or copper sulphate may be useful.

Although the character of pain would indicate that free divulsion of the sphincter muscle would be indicated, it will be found that it does no good. A much better plan is to divide the muscle by incision.

As internal remedies such agents as arsenic, the bromides, iron, and strychnine are the best. Along with these cod-liver oil, or the hypophosphites will be of benefit.

VILLOUS TUMOR OF THE RECTUM.

Comparatively few villous tumors of the rectum have been reported; indeed thirty would cover the number. The writer has met with two cases in an experience of nineteen years in rectal surgery. The tumor is recognized as a spongy mass with long villous-like groups over its surface, and has a broad stem which attaches it to the wall of the bowel. The tumor may have its origin in any portion of the rectum, but they are usually situated low down, in reach of the finger. In the writer's cases no pedicle could be made out, but, instead, the base was broad and short.

Symptoms and Diagnosis.

A villous tumor of the rectum could be easily mistaken for a mass of hæmorrhoids, as it protrudes during the act of defæcation. A better diagnosis can be made by feeling the mass while in the rectum. Hæmorrhoids cannot be so felt. From polypi they can be diagnosticated by the soft spongy feel, instead of the firm and solid appearance of a polyp. Then, again, the great disposition to bleed, and the free discharge of mucus, is nearly characteristic. The question has often been raised whether these growths are not really malignant and would return if removed. As has been stated, the writer has removed two villous tumors of the rectum, and although a number of years have elapsed they have not returned. There is not the gland-involvement and the cachexia in these cases that is found in cancerous growths, neither is there the loss of flesh that is so characteristic of the latter. There can be no question, however, that a villous growth can and sometimes does undergo cancerous degeneration. Authors have reported their recurrence after removal, and, in a few cases, death from malignant disease.

Treatment.

There is but one plan of treatment for a villous tumor, viz. removal. It is fair to say that in this modern day of research no one would question the advisability of removing any tumor wherever located, but especially is this true of a growth that in any way resembles malignancy or is likely to become malignant. The best plan of operating for this class of tumors is by double transfixion and cutting away the mass. It has been mentioned by a few writers that villous tumors of the rectum sometimes "shed" themselves, thereby saving an operation, and that the patients have recovered.

PROCTITIS.

THERE can be no question that the rectum is frequently the seat of inflammation. There are many causes that would be conducive to this state: for instance, hardened fæces remaining in the pouch of the rectum; foreign bodies in the rectum; continued nerve-irritation; gonorrhœal infection, worms, unnatural* intercourse, and trauma. It has not been the observation of the writer that constipation is often an exciting cause, and he holds to the theory that accumulations of fæces seldom take place in the rectum.

SYMPTOMS.—The most prominent symptom of proctitis is a sense of heat and weight in the rectum, straining at stool, some tenesmus, a discharge of mucus, sometimes tinged with blood, an uneasy sensation after stool as if the bowels had not been completely evacuated, and an interference with the proper action of the bladder. Upon examination by the speculum, nothing will be discovered but a highly colored and sensitive mucous membrane.

TREATMENT.

The patient should be put upon bland nourishment; the bowels moved daily with an aperient water, preceded possibly by a dose of calomel; the secretions of the kidney watched, and sexual intercourse interdicted. The rectum should be washed out daily with copious injections of hot water containing boric acid, and followed by mild astringent washes, as fluid hydrastis, borax-water, or a mild solution of lead-water. Anything stronger than this is scarcely necessary.

DIARRHŒAL DISEASES AND DYSENTERY.

By W. W. JOHNSTON, M. D.

ACUTE INTESTINAL CATARRH (ACUTE CATARRHAL ENTERITIS; ACUTE DIARRHŒA).

By an acute intestinal catarrh, acute enteritis, or entero-colitis must be understood an inflammation of the mucous membrane from the pyloric orifice to the rectum. The disease may have several varieties as to intensity and involvement of more or less of the intestinal tract. There may be every grade of inflammation from superficial catarrh to that in which there are glandular and lymphatic changes. Such anatomical changes may so involve various portions of the intestine that a study of the symptoms for the localization of the disease is necessary to the proper direction of the treatment. Diarrhœa is not present in all these forms; the only positive symptom of acute intestinal catarrh is the presence of mucus in the stools, whether the movements are diarrhœal or not; thus the treatment of the disease would vary with the intensity, the localization, and with the consideration of the etiological factors, predisposing or exciting.

Some of the predisposing causes that influence the treatment are primarily such as occur in the weak and debilitated, and in old people. Among other predisposing causes are vicissitudes of temperature, extreme heat of summer, poor hygienic surroundings, improper food, impure drinking-water, insufficient clothing, and previous and frequent attacks.

As secondary causes, predisposing to intestinal catarrh, may be mentioned extension of disease, as from gastritis, proctitis, peritonitis; disturbances of the venous circulation; infectious diseases, as epidemic influenza and sepsis; chemical irritants acting through the blood, as urea, or toxic substances absorbed by the skin from extensive burns and eliminated through the biliary secretion.

The most common exciting cause is some error in diet in quality or quantity, more seldom a chemical substance in a concentrated form, as drastics, mercury, phosphorus, or arsenic. More frequently a chemical irritant, formed in the fermentation and decomposition of food and in bacterial growth, is the proximate cause. Thus various

irritating organic acids, ptomaïnes, toxins, and toxalbumins are formed, and set up and maintain a functional disturbance of the proper mechanism of the intestine. That these new chemical poisons —toxins—are sufficient to cause as well as sustain irritation of the intestine is shown by the erythema produced on the nates from contact of the diarrhœal discharges. The danger to the patient lies in the absorption of these toxins by the blood and by the infection of the general system, which is favored by an inefficiency of the function of the liver. The nervous system is particularly affected, as also the urinary, circulatory and respiratory systems.

Treatment.

Prophylactic Treatment.—A change of climate to the mountains or the seashore before the beginning of hot weather is the most efficient precaution that can be taken by those predisposed to diarrhœa, in frequent recurrent attacks, from old age, long-continued disease, and general debilitating influences. This precaution is particularly applicable in the case of infants and children.

One attack predisposes to a second, so that a strict hygienic and dietetic treatment, to be continued for at least one year, is to be enforced. The avoidance of intemperance in the quality and quantity of food, imprudent exposure to wet and to sudden changes of temperature is all-important. The knowledge of the diathesis of every individual case is of service in formulating advice as to diet, clothing, mode of living, etc.

General Rules of Treatment derived from a Knowledge of the Etiology of the Disease.—Where the cause is the ingestion of improper and indigestible foods, accompanied with paroxysmal pains, and infrequent, small stools, a cathartic, as castor-oil, or calomel gr. ij–v, sodium bicarb. gr. ij–v, followed by a saline purge, is to be given to expel the foreign substance, and thus lessen the time for fermentation and putrefactive changes, and further injury to the delicate mucous lining of the intestine.

All the forms of acute intestinal catarrh have a certain varying amount of gaseous formation, as shown by the tympanites and borborygmi, whose origin is explained by the fact that fermentation and putrefactive changes are occurring as a result of bacterial action upon the food; bacteria find their pabulum for multiplication in the decomposing substances. If we could reach these micro-organisms and arrest their activities, and remove the mucus and decomposing fluids, then we would accomplish earlier results and a quicker return to the normal state. That the intestinal canal is difficult or impossible to disinfect is due to our imperfect methods or to anatomical conditions, and not to the incorrectness of the theory of antisepsis.

In the cases where bacteria are the cause, indicated by the formation of gas, acid reaction of the fæces, and increase of indican in the urine with sulphuric ether compounds, with marked increase of bacteria in the stools, the administration of intestinal antiseptics, combined with or followed by a cathartic, is the nearest approach to disinfection that can be obtained. The requirements of an antiseptic employed are that it should be non-poisonous, insoluble in the stomach and very soluble in the intestine, and if possible it should emulsify with the fats and still retain its antiseptic properties; and the dose should be large and frequently administered. This is to be followed by a cathartic and strictly sterilized food, given during the period of illness. The antiseptic remedies used are principally bismuth salicylate gr. i–xv, every two to three hours, calomel gr. $\frac{1}{6}$–$\frac{1}{2}$ given every hour for five doses, bismuth subnitrate gr. x–xv–xxx, and salol gr. v. Benzo-naphthol gr. viij in powders, followed by occasional doses of calomel sufficient to purge slightly, has good results in many cases. The following formula may be used; excellent results have been obtained from it where auto-intoxication was evident:

℞. Benzo-naphthol., gr. ij (0.10);
Bismuthi salicylatis, gr. v (0.30);
Resorcin., gr. ij (0.10).
M. et. ft. in pulv. j.
Sig. One every three hours.

Followed by calomel gr. v with sodium bicarb. gr. v.

Resorcin, creasote, salicylic acid and naphthalin have been advocated as antiseptics. Beta-naphthol was warmly praised by Bouchard, as it quickly and effectually deodorized the stools, but is open to objection, as it is irritant to the stomach and reduces the secretion of hydrochloric acid. Benzo-naphthol is non-irritant and does not impair the gastric secretions, yet has all the qualities of the antiseptic action of beta-naphthol, and is therefore preferable. It may be given in doses of gr. iss–viij in powders, repeated every two or three hours.

Tanningen or diacetyltannin—gr. iv–xv, three times a day—is insoluble in the stomach; tannic acid is set free where the reaction is alkaline, and thus the active agent is brought in direct contact with the surface to be influenced.

Hayem recommends lactic acid in the form of a lemonade, composed of $\frac{1}{2}$ ounce of lactic acid, 7 ounces of simple syrup, and 20 ounces of water.

The most rational method of reaching the causative agents, namely

the bacteria and their products, is by rectal irrigations with antiseptic solutions by which the foreign substances are washed away, meteorism reduced, and the bacteria made inactive, leaving a clean surface of mucous membrane. The following antiseptics may be used in this manner in the strength indicated:

				Grammes.
Boric acid	ʒiss–ij	. . to the pint	. .	(6.–8. to 500).
Creolin	gr. iv–viij	" "	. .	(0.25–0.50 to 500).
Thymol	gr. iv–viij	" "	. .	(0.25–0.50 to 500).
Tannic acid	gr. xxx–lx	" "	. .	(2.–4. to 500).
Salicylic acid	gr. xv	" "	. .	(1. to 500).
Naphthol	gr. iss–ij	" "	. .	(0.09–0.12 to 500).
Potassium permanganate	gr. iss–v	" "	. .	(0.09–0.30 to 500).
Carbolic acid	gr. v–x	" "	. .	(0.30–0.60 to 500).

The first in the list is the safest and the last the least safe. Mercuric chloride is dangerous in any strength, and nitrate of silver is more adapted to the chronic form, particularly when ulcerations exist. Formalin, 1 : 10,000, has been used, but stronger solutions have proved too irritating to the bowel.

The irrigations should be continued twice daily. Should there be a lessening in the number of stools, in putridity, meteorism, and the amount of mucus, it is an indication for lengthening the intervals of treatment.

Treatment of Clinical Varieties.—The disease may be divided clinically into three forms, namely: I. Mild form. II. Moderately severe and Severe forms. III. Choleraic form.

I. Mild Form.—Even in the mildest form, when diarrhœa exists without fever, rest combined with fluid diet and the avoidance of solid food for twenty-four or forty-eight hours will shorten the attack and result in cure in a few days. Milk is most suitable in all cases, with the addition of lime-water, or diluted one-third with barley-water or Vichy water. After the first twenty-four hours the patient may take light beef-tea or thin broths. After the diarrhœa subsides we may give soups, a soft-boiled egg, gradually increasing to a solid diet. Should the diarrhœa continue and be accompanied with slight pain, bismuth subnitrate or salicylate may be given, combined with opium to lessen the number of stools and relieve pain, but not in doses sufficient to stop the movements too quickly.

The attack may be a simple duodenitis, the indications of which are pain with flatulent distention and subsequent icterus. The fæces have a penetrative odor, contain unaltered fats, and mucus is intimately mingled with the fluid stool. Strict attention to diet, avoidance of starches and solid foods as long as these conditions continue, will soon bring relief.

II. Moderately Severe and Severe Forms.—Where the

attack is more severe, attended with fever and with colicky pains and tenesmus, borborygmi, distention, and diarrhœal dejections that are soft, watery, and frothy from gases, the patient should be kept in bed and not allowed to rise to stool. Hot fomentations or sinapisms may be applied to the abdomen for the relief of the pain; afterward a flannel binder should be worn. Food should be abstained from during the first twenty-four or forty-eight hours, and small quantities of barley-water and rice-water given to relieve thirst; a little hot brandy and water may be given when the pulse indicates weakness. Then, after a day or two, milk should be given and persisted in until the diarrhœa has ceased; or, if pure milk is not tolerated, it should be diluted one-half with barley-water or rice-water. Expressed beef-juice may be given instead of milk, in small quantities at short intervals.

Internally bismuth subnitrate, gr. v–xx, with Dover's powder, gr. ii–v, or 5 to 8 drops of the deodorized tincture of opium, may be ordered to check the diarrhœa; or morphine, gr. $\frac{1}{4}$, hypodermically, to produce quiet and relieve pain. Opiates should be cautiously given in doses sufficient to diminish the stools gradually: too large doses would arrest peristalsis and thus increase the colic, fever, and catarrh. In case of nausea and vomiting the opiates may be given by enema, as tinctura opii, gtt. x, normal salt solution ℥ij; or in suppositories, morphia gr. $\frac{1}{4}$, ext. belladonnæ gr. ss, ol. theobromæ q. s.

Although the symptoms may cease after this course of treatment, yet the catarrh still persists and the normal anatomical condition of the mucous membrane of the intestine is not reached, so that a strict liquid diet is to be continued, gradually adding broths, soups, beef-tea, sweetbreads, meat jellies, and other solids of easy digestion, as improvement takes place. It must be urged that cold water is to be avoided, as are also fruits, fatty, farinaceous, and acid foods.

The seat of this form is chiefly in the ileum and colon—ileo-colitis—rarely in the ileum alone. If in the ileum alone, there may be no diarrhœa, but the presence of mucus disseminated in the dejecta as small hyaline mucous particles, with indican in the urine, are diagnostic indications. The same treatment is called for in this class of cases. Rectal irrigations, as suggested in the article on Dysentery, are advisable in this form, especially if the stools are putrid.

III. Choleraic Form.—Should the case be one more severe, where symptoms of collapse are imminent, as pinched expression of the face, emaciation, accelerated and small pulse, cool skin, cold sweats, cramps in the extremities, etc., with frequent liquid stools without color or odor, with much or little mucus, numbering twelve to twenty-four in twenty-four hours, accompanied or not with pain, tympanites, and tenesmus, the patient should have absolute rest in bed, not being

allowed to rise to stool; external heat is to be applied to the abdomen and body, a hot mustard foot-bath given, with hypodermic injection of morphine, gr. $\frac{1}{4}$, to stop the purging. If the patient be exhausted and cyanosed, hypodermoclysis or intravenous injection of normal salt solution (6 : 1000), one litre, should be given, also stimulants hypodermically and small quantities of iced cognac by the mouth. After the subsidence of the most dangerous symptoms, when the patient gradually recovers from the collapse, the free administration of water is first called for. Milk diluted is peculiarly efficacious in such cases, and the reason is no doubt to be found in the fact that it diminishes the number of bacteria in the intestine. Gilbert and Dominici have discovered that in men and the lower animals an exclusive milk diet will reduce the bacteria in the fæces to one-seventh of the normal. No solid food should be allowed until the stools are normal in character, milk being given exclusively.

The medicines used are principally bismuth subnitrate and opiates to relieve pain and reduce the number of stools.

In this as in the previous form, rectal irrigation with the antiseptics used for the purpose, as mentioned above, is of special service in reducing and aiding in the expulsion of the toxic substances formed in the intestinal canal, although in the acute stage the patient is usually too ill to permit of this treatment. The locality of this form of the disease is in the ileum and colon—chiefly a colitis—where the irrigations may be used with benefit, as they come in direct contact with the diseased portion of the bowel.

For the collapse, besides the restoration of water to the blood by intravenous and subcutaneous injection, it may be required to sustain the heart action with nitro-glycerin, strychnine, and whiskey administered hypodermically.

In infants and children acute intestinal catarrh is chiefly found in the ileum and colon, and is designated as ileo-colitis. The lesions are much the same as occur in the adult, and the duration of the illness depends upon the nature and extent of the process. The general prophylactic treatment, hygiene and dietetic, should be applied here as with the adult; the peculiarities to which children are prone, however, make certain special rules necessary.

Prophylaxis, regarded from an etiological standpoint, is the only way to the prevention of the disease. Children should have change of climate, especially in the summer months, and many lives may be saved by timely insistence on this point. Sufficient clothing, cleanliness of the body by bathing, changing of napkins, and washing of nipples and bottles will lessen the large number of cases. It is important to give children sterilized foods; milk sterilized is best—this should be given at regular intervals during the day, say every

two hours, and no food from 11 P. M. until 6 A. M.; in older children no food should be allowed from 10 P. M. to 7.30 A. M., in order to give the stomach and intestine the proper amount of rest and time for the digestion of the food previously taken. Regularity in feeding, in the quantity and quality of the food, bathing, fresh air, and sleep will add a great deal to the health of the child; overfeeding should be avoided. The presence in the stools of masses of undigested casein or the frequent vomiting of milk is evidence that, for the time being at least, the food is in excess.

In mild cases, where there is diarrhœa and vomiting with a slight rise in temperature, avoidance of all food for the first twenty-four hours is imperative; after which barley- or rice- or albumin-water, or wine whey may be given in small quantities, increasing the amount should improvement take place. Later diluted milk may be cautiously tried. If this treatment does not suffice, bismuth subnitrate, in doses suited to the age, should be given every two or three hours, and irrigation of the colon two or three times daily with a mild antiseptic or astringent resorted to.

Should the case be of greater severity, accompanied with pain, tenesmus, and vomiting, frequent and bloody stools, then the means already given are to be tried, with hot fomentations to the abdomen to relieve pain. Opium is not well borne by children, and therefore should not be used unless urgently demanded. Should the pain continue, deodorized laudanum may be given in appropriate dose to relieve tenesmus and lessen purgation. Rectal irrigation with cold or hot water is to be used twice daily, followed by tannic acid solution (ʒss to Oj) for its hæmostatic and astringent as well as antiseptic effects. Boric acid solutions in most cases fulfil the requirements without recourse to stronger remedies.

Where the case is very acute, associated with symptoms of prostration and frequent liquid stools, containing mucus, blood, or pus, then absolute rest, combined with careful feeding and with brandy or whiskey for the needed stimulation, hot fomentations to the abdomen, crushed ice to relieve thirst, and antiseptics by the mouth or by rectal irrigation, are measures to be employed.

When the child recovers sufficiently from the diarrhœa and accompanying symptoms, proper feeding at regular intervals is the principal matter for the physician's attention; his directions should be clear and precise, covering two weeks at least. Occasional irrigations of the colon once daily may be continued until the stools are normal and without mucus.

The dieting should be made a special study in children prone to such attacks, and the stools subjected to microscopic examination in order to detect any fault in digestion.

CHRONIC INTESTINAL CATARRH (CHRONIC CATARRHAL ENTERITIS; CHRONIC DIARRHŒA).

In the treatment of chronic intestinal catarrh with chronic diarrhœa much is dependent upon the stage and degree of the chronicity and upon the predisposing and exciting cause. It may be a distinct and primary disease or, as most commonly occurs, it is a sequel to frequent attacks of acute intestinal catarrh. The anatomical changes of the intestinal wall may involve all the coats; atrophic or hypertrophic condition of the mucous membrane may exist, and, with the other organic changes that follow a long-continued catarrh, there would be no possibility by treatment of securing a return of the structures to a normal condition. Nothnagel found in 80 per cent. of his cases an atrophic condition of the mucous membrane. Jürgensen, Blaschko, Sakaki, and others found changes in the nervous system, involving particularly the plexuses of Meissner and Auerbach, in this same form.

In cases where destruction of the epithelial lining takes place there results auto-intoxication from absorption of the products of the fermentation of carbohydrates and putrefactive substances from proteid decomposition by microbic action. Should the absorption of these toxins, toxalbumins, aromatic substances, and ptomaïnes be in excess of what can be gotten rid of by the liver and excreted by the kidney, then a number of varied symptoms occur involving the intestinal tract, as nausea, eructation, vomiting, diarrhœa, colic, etc., and the nervous system, as headaches, vertigo, insomnia, irritability, and depression of spirits. A reduced secretion of bile also predisposes to the increase of decomposition-products.

The presence of mucus in the stools is a positive indication of this pathological condition, and is found either within the fæcal masses or coating them, according to the location of the lesion in the intestine.

Treatment.

The best means for treating these morbid processes is by a strict regimen of diet suited to the individual's capacity; and without the ready concurrence of the patient in this treatment it is useless to attempt a cure.

Where the disease is due to long-continued, passive congestion of the portal vein, as in cardiac, pulmonary, hepatic, and nephritic diseases, or from debilitating disease, as tuberculosis, or as a sequel to typhoid fever or dysentery, then the treatment applied should be as the individual case demands for these conditions.

There are three forms of the disease that require somewhat different forms of treatment. It may be characterized (1) by constipation,

with the presence of varying amounts of mucus in the stools; (2) by occasional and recurring attacks of diarrhœa from catching cold or imprudence in diet; or (3) by constant diarrhœa.

(1) *Constipation* occurs most often in these cases, and is the rule in chronic catarrh of the colon, due not to any loss of the muscularis, as the muscular coat is intact, but probably to a reduced or lowered physiological function of the nervous system of the intestine caused by inflammation, and to increased density of the fæcal mass from deficient secretion. In this form the stools are composed of dry, dark, and crumbled scybala, or they may appear normal, covered externally with tenacious mucus or even with pus should there be follicular ulceration. Allied to this condition is abdominal distention, borborygmi, uneasiness and distress in the abdomen after eating, occasional cutting pains which subside after a movement, vertigo and præcordial distress, and increased sulphuric ether substances in the urine, all due chiefly to fermentative decomposition and auto-intoxication, which are partly relieved by the expulsion and eructation of gas. The treatment is principally by diet and intestinal antisepsis, combined with cathartics. Care as to proper hygiene, removal of any debilitating influences, as care and mental anxiety, advice against imprudent eating and drinking and other dissipations are necessary and should receive important consideration.

In these cases climatic treatment in a mountain region is better than at the seashore, high altitudes in a temperate or southern climate in winter being most desirable. Mental rest and diversion from all home and business cares may aid in the cure if continued for from several months to a year. Especially in cases complicated with hypochondriasis, melancholia, or neurasthenia, which are not rarely met with, is a prolonged residence in the mountains to be recommended in order to prove of permanent benefit. An abdominal binder should always be worn; moderate exercise, especially on horseback, massage, light gymnastic exercise, and warm baths with friction are advisable. The habit of going to stool at a regular hour every day is to be urged, and the stooping posture at stool is much to be preferred to the seated position of the ordinary closet. Indeed, a return to the primitive methods of defæcation is often curative.

Frequently this condition is accompanied with a decrease of the proper biliary and pancreatic secretions, so that the diet prescribed must be easy of digestion: this must take place chiefly in the stomach, leaving a minimum amount of intestinal work. Regularity in eating and the proper mastication of food is the first principle. The preferred articles of food are: rare, scraped beef, toasted bread, beef-essences, cocoa, light soups, boiled chicken, white meat of game, milk, which if not tolerated should be boiled, soft-boiled and raw eggs,

koumyss and matzoon, sweetbreads, and oysters. If the case be an obstinate one, then this diet should be restricted to fluids, returning to solids gradually as the condition improves. These patients should principally avoid cold drinks, acid or sweet foods, puddings, fats, pastry, and most starch foods, most vegetables and fruits either cooked or raw. Any unobjectionable mineral waters may be suggested, as they are both diuretic and diaphoretic, and, as a purgative is often required, the Bedford, Hunyadi, or Carlsbad waters may be used.

The medicinal treatment may be directed first to aid digestion, with pepsin and hydrochloric acid given after meals so as to diminish the work of the intestine. For constipation the various cathartics, as calomel, cascara, aloin, or podophyllin with belladonna and strychnine, can be given. It may be necessary to use enemata, which, given in small quantities and at the same hour every day, will in time re-establish the habit of defæcation.

(2) Frequently *constipation* and *diarrhœa* alternate, due to the irritation of the intestinal nervous system by scybala and the decomposing microbic products formed during constipation, or to slight changes in temperature, and indiscretions in diet. Care as to diet and clothing and avoidance of cold or wet, will be needed for the relief or cure of this form of the disease. The stools will show articles of food undigested, mucus in small lumps, disseminated in small fæcal masses and in fluid stools; at first these are formed and covered with tenacious mucus, afterward they are fluid and bile-stained. This class of cases often suffer with meteorism, pain, and nervous symptoms which abate after regular evacuation of the bowels. The general condition of these patients may be excellent for years, and only with imprudent exposures and taking cold do symptoms of diarrhœa arise, which soon cease after proper care as to hygiene and diet. Besides rest and diet and other measures to aid digestion and improve the general health, various intestinal antiseptics, as bismuth salicylate, salol, benzo-naphthol or resorcin, should be prescribed where symptoms of auto-intoxication are apparent.

(3) *Diarrhœa* may be the chief symptom; the stools may number from one to twelve in twenty-four hours. In the one case there may be from one to two stools every day of watery or semi-solid consistency; in the other case there may be frequent diarrhœal stools containing undigested food, mucus, and bile-pigments. The plan of treatment consists in the restoration of the nervous function and inflamed mucous membrane of the intestine to the normal. When borborygmi, persistent flatulency, and pain are frequent symptoms, milk diet should be persevered in for several weeks, and solid food, starches, and fats avoided; hot fomentations and rest in bed may be necessary to relieve the pain.

Antiseptic medication by the mouth and irrigation of the colon should be used for disinfecting the lower alimentary canal. All efforts are needed to improve nutrition by regulating the life of the individual, by careful exercise, strict regimen of diet, baths, massage, and appropriate change of climate. Sometimes partial or complete rest may be resorted to in order to check the continual drain of fluid movements. Opium, the routine use of which is to be condemned, is our only valuable remedy for intense pain, but should not be long continued. When the diarrhœa is checked by this treatment the disease is by no means cured, and the *restitutio in integrum* is only obtained by continuing liquid diet. Milk should be the principal article of food; alternating with this koumyss, matzoon, buttermilk, beef-juice, and some of the various prepared and predigested foods may be used. Return to solid foods should be delayed until some benefit is assured; after continual improvement for a month the most digestible foods may be added to this list, such as scraped and finely minced beef, raw or slightly cooked; soft-boiled eggs and oysters, each being added gradually to the dietary and its effect watched carefully. The disappointment in the treatment usually results from too early return to mixed diet after cessation of the diarrhœa.

Internal medication is of little value, yet various antiseptic remedies may be given to prevent fermentative decomposition, such as bismuth salicylate, benzo-naphthol, lactic acid, and salol.

The usual seat of the disease is the colon, so that much is to be expected from treatment by irrigation of the rectum and colon with astringents and antiseptics, as mentioned in the article on Acute Intestinal Catarrh. The method of irrigation is the same as described and employed in the article on Dysentery. Tannic acid, boric acid, zinc sulphate, and alum may be employed in this way in the strength of from 1 to 2 : 500. These should be used two or three times daily; the antiseptics are to be preferred to the astringent remedies mentioned.

Stimulants must be given in most cases, especially in old people or those having a sluggish circulation from organic disease. Strychnine and alcohol are the best forms of stimulant.

Where the inflammatory process continues to the ulcerative form of the disease—follicular ulceration—as recognized by emaciation, debility, anæmia, diarrhœal stools containing mucus, blood, and pus, with shreds of mucous membrane, everything should be done to improve and maintain the general nutrition with local treatment by irrigation of the lower bowel with antiseptics. The milder agents, as boric acid, are the best. A remedy for this purpose that will stimulate to healing, besides acting as a mild astringent and antiseptic, is silver nitrate in strength of gr. viii–xv to Oj.

In chronic duodenitis and chronic ileitis, the dietetic plan of treatment is most important. Foods most easy of digestion by the stomach and the avoidance of fats and starches are to be prescribed in order to minimize the work of the intestinal digestion.

In colitis the methods and remedies mentioned for irrigation are most appropriate and effective.

There is another class of cases in which the marked symptom is expulsion of membranous-like masses of mucus of various shapes and forms, some being moulds of the intestine. This is most often associated with neurasthenia and atonic dyspepsia, so that it may be said to be a symptom of disorder of the nervous system. It is sometimes found in association with floating kidney. The treatment in such cases would be to influence the mind of the patient by removing depressing influences: change of climate and residence to the mountains, camping out, exercise that pleasantly occupies the mind, electricity, special nutritious diet, tonics and aids to digestion are all necessary to influence this condition. Sometimes rest is of more benefit and, with attention to proper digestion, is all that is needed. Uterine and ovarian disorders should be remedied. This form of the disease, mucous colitis, occurs more frequently in women than in men and between the ages of forty and fifty years. When there is constipation, then the use of mild laxatives, as aloin, podophyllin combined with belladonna and strychnine, are to be preferred to drastic cathartics or salines. Water should be taken early in the morning and during the day, and a habit of going to stool regularly every day should be established.

ACUTE DYSENTERY.

More or less chaos exists at the present time on the subject of dysentery. The former symptomatic classification has been unsettled by the proved connection between the tropical form of the disease and the amœba coli; but as no parasite is uniformly found in the sporadic disease with so-called "dysenteric" symptoms, it is not possible to class all such cases under one specific form, or even to assert that they are all due to a specific cause. It is probable that there are various forms of dysentery from different micro-organisms, and there may be a non-specific form due to "catching cold" or to the presence of indurated fæces or foreign bodies, but on these points there is still much uncertainty. Fortunately the treatment that aims at destroying micro-organisms in the colon and rectum is so successful that, for the present, as far as the therapeutics of the disease goes, we may regard all cases as local infections to be treated as such.

The disease has its seat in the colon and rectum, where inflammatory changes occur involving the mucous lining, the tubular and solitary glands. Accordingly the symptoms are those of a very acute colitis, characterized by frequent stools with the discharge of blood, mucus, and pus, and accompanied with fever. Thus, in the treatment of the disease, accepting the microbic theory, the tendency is to apply the principle of asepsis and antisepsis, using remedies and methods that cause destruction or retard the further development of micro-organisms in the colon and rectum. The older empirical or symptomatic methods are ceasing to be employed unless consistent with the prevailing views of the pathology and pathogenesis of the disease.

An attack of acute dysentery may begin with premonitory distress in the abdomen, occasional chills, and a feeling of general malaise; then follow the characteristic symptoms that mark the disease—namely, fever with more or less prostration, tormina, tenesmus both rectal and vesical, and mucus and bloody stools. A mild case may last from a week to ten days and have slight fever, tenesmus, and burning in the rectum, with frequent evacuations of blood-stained mucus. In the more severe form these symptoms are intensified, the stools becoming bloody or purulent, containing membranous flakes or shreds, or even moulds of the large intestine; there are vomiting and thirst, tympanites, tenesmus, and tormina, great exhaustion and profuse sweating, with delirium, the illness lasting two, three, or four weeks. The treatment must take into account the gravity of the case, measured by the height of the fever, the strength of the heart-beat, and the state of the circulation, the degree of prostration, and the character and frequency of the stools. When the stools are involuntary, painless, and fœtid, containing membranous shreds and pus, there is a more serious pathological process than when they simply consist of mucus, pure or blood-stained. Consideration as to the locality of the lesion, the presence of ulcers, putrid decomposition in the bowel and possible auto-infection from this source, and the probable existence of a micro-organism in the intestine as the cause of the disease, must be taken into account when prescribing for these cases.

Treatment.

The preventive measures applicable to the treatment of dysentery are in common the same as those conducive to good health in general. Where there is a damp soil, imperfect drainage, overcrowding such as occurs in public institutions, imperfect ventilation, impure drinking-water, careless disposal of the excreta—conditions that are prejudicial to health and favorable to the invasion of the disease, the rules are plain as to what should be done to prevent the outbreak of dysentery, especially in an epidemic form. When an epidemic does occur, atten-

tion should be paid to public and individual hygiene: the disinfection of the excreta and the securing of pure drinking-water are essential. All drinking-water should be filtered and boiled, regardless of its source.

At the onset of the disease the patient should be put to bed and have absolute rest, and the bed-pan should be used from the first. The bed-covering should be sufficient to keep the feet and surface warm and to prevent chilling; good ventilation, strict cleanliness as regards the disinfection of the stools, clean bed-clothing and washing of the anal region with antiseptic lotion of carbolic acid, lysol, or creolin, after evacuation, should be insisted on from the beginning. Hot fomentations and poultices to the abdomen may give the patient a feeling of comfort and aid in relieving pain. The use of ice locally over the region of the colon would seem to be a rational means of reducing the intense hyperæmia of the earlier stages, but it has not been much advocated. Without care in treatment the mildest case may take on a severe course and the intensity of the symptoms increase from the destruction of tissues by necrosis and from the absorption of decomposition-products of microbic origin.

Diet.—Errors in diet, improperly digested food, and the fermentation and decomposition resulting therefrom, add much to the danger and to the gravity of the symptoms. Concentrated foods, easily digested in the stomach, as broths or beef-essence in small quantities, with rice-water and barley-water to relieve thirst, are best suited to these cases. Milk is sometimes not well borne, and the presence of casein in the stools will be an indication for its discontinuance. If milk be given, it should be diluted one-third or one-half with lime-water, barley-water, rice-water, or Vichy water, or it may be sterilized or peptonized. It should be given in quantities of from 2 to 4 ounces every two or three hours. There should never be any overloading of the intestinal tract with food. It is difficult to get perfect digestion; moreover the increase of the waste products would add to the irritation and to the possibility of auto-infection from any decomposition that may arise. Enough food should be given to maintain the strength of the patient, and as improvement takes place, recognized by the change in character of the stools and relief of pain, the quantity may be increased. Solid food should be withheld for some time, as increased peristalsis and additional waste products may cause the reopening of the healing ulcers.

Laxatives.—The use of laxatives is rational as applied to the disinfection of the intestinal canal, by removing contents that irritate mechanically, and which, by their retention, pave the way for putrefactive changes. The treatment of a case may well be begun by the use of a saline laxative, as magnesium sulphate, sodium sulphate,

sodium and potassium tartrate, or castor oil, especially where the stools are small and composed of scybala coated with mucus and blood. In children the use of calomel is to be preferred, especially when vomiting occurs. There must be sufficient dosage to obtain free watery movements with the least amount of irritation, as increase of peristalsis will, to a certain extent, be harmful to the already actively inflamed intestine. Where the stools are copious and fluid, and diarrhœa already exists, the use of purgatives, as a "method," may do much harm. If daily irrigation of the bowel is employed, there is rarely a necessity for repeating a cathartic, as the bowel is kept clean of any accumulation of fæcal matter and of decomposing fluids. If constipation sets in after the subsidence of the acute inflammation, a cathartic is necessary.

Opium.—Opium, if needed to diminish peristalsis and pain, should be given in small doses, but never in doses sufficient to arrest the movements completely or to check them too suddenly; the most sudden and even fatal collapse may follow the breaking of this rule. Especially is it to be remembered that opium is not to be given where the stools are liquid and putrid, as such accumulations are much better expelled. The use of irrigations of the lower bowel, as will be spoken of hereafter, will remove any danger of absorption of toxic substances and also lessen the number of stools. Where there is intense pain and insomnia, opium is of great value, and is best given in the form of morphine hypodermically; in this way its effects can be better regulated. It may also be given in the form of Dover's powders or deodorized tincture of opium. These should be given in small doses at safe intervals; the effects must be carefully watched so as to avoid all risk of narcosis.

Ipecacuanha has for a long time been held especially efficacious in cases with high temperature and intense tenesmus. Large doses of ipecacuanha are recommended by the Anglo-Indian physicians, but it has never met with favor in this country; some benefit is claimed when administered in quarter-grain doses every half-hour. No curative action can be looked for in this drug, and even the most enthusiastic supporters have less reliance in its action than formerly. Astringents are without effect and are harmful in that they derange digestion.

Large doses of **bismuth subnitrate** every three hours, during the day, have had beneficial effects at the hands of some physicians.

Intestinal antiseptics, as magnesium salicylate, bismuth salicylate, gr. x–xv, benzo-naphthol gr. v–x, may be used to assist in the disinfection of the canal, particularly where meteorism from decomposition is present. Calomel given in small doses and at short intervals has the combined action of an antiseptic and mild cathartic; Dover's

powder may sometimes be given during the course of administration of calomel; it will relieve griping and prevent too active action of the calomel. This treatment should be continued several days to be of any benefit. Corrosive sublimate in small doses, from gr. $\frac{1}{120}$ to $\frac{1}{60}$ every hour, has been employed for the same purpose.

Local Treatment of the Rectum and Colon by Suppositories, Injection, and Irrigation.—The ancients washed out the bowel for the removal of "acrid humors" which they thought intensified the inflammation. Pathological research at the present day shows us that the ancients were right, and that if we could keep the bowel thoroughly clean and aseptic, as we do an external wound, we would be better able to cure dysentery.

In 1826 Joseph Kent used cold-water injection, and O'Beirne first used the long gum-elastic tube, "to give exit to the accumulated and pent-up contents of the cæcum and colon." Hare, in 1849, said that the use of a long tube was like changing a huge internal abscess to an external one and enabled us to wash out and cleanse it from its putrid contents. He also stated that by getting rid of the acrid secretions resulting from sloughing ulceration, the use of local applications would diminish the terrors of dysentery. Hare also advises frequent repetitions of the process of cleansing whether the stools are solid or liquid.

As far back as 1774, the theory of antiseptic treatment was accepted. Peruvian bark, chamomile-flowers, calumba, charcoal, calcium chlorate, sodium hyposulphite, creasote, and other similar substances were necessarily employed. In 1879 Cantani recommended the local use of carbolic acid, sodium salicylate, sodium biborate, etc. for the disinfection of the colon in dysentery and prophesied good results from this form of treatment.

A number of reports since then have confirmed this prediction, and now the plan, in some form or other, has come into use in all countries.

Various methods have been adopted, all of which have the same end in view, being designed to act locally upon the inflamed surface:

1. Treatment by suppositories and by small injections.

2. Treatment by large injections which are retained and are passed by the voluntary effort of the patient.

3. Treatment by lavage with large quantities of fluid, the immediate escape of the fluid being provided for.

1. *Suppositories.*—It is plainly seen that in the use of suppositories containing astringents the action is purely local and is probably at most only applicable in rectitis. Suppositories containing opium or morphine may be beneficial in relieving the tenesmus. When used in this way the rectum should be first irrigated and cleansed of mucus.

Antiseptic remedies may be used in suppositories alone or combined with opium. Cocaine has been used in suppository form, but has not acted as efficaciously as might be expected from its antiseptic effect upon mucous membrane.

The use of *small injections* has a limited field, except for the cleansing and evacuating of the contents of the rectum. Starch-water and laudanum may be given in this way, but only after the use of the first-named injection; the dose should not be sufficient to cause a general physiological effect of the opiate, a mere local action to relieve tenesmus being desired. These methods are not mentioned with approval.

Solutions of silver nitrate, containing gr. $\frac{1}{2}$ or gr. $\frac{1}{4}$ to the fluid-ounce, together with 5 to 10 drops of deodorized tincture of opium, not more than from ℥j to ℥ij being used at a time, are serviceable where the inflammatory area can be reached by these low injections and when it is not of an intense degree. Small injections of astringents or of ice-water or the introduction of small lumps of ice into the rectum have been recommended, but with some these measures have seemed to increase instead of decrease the inflammatory process. The application of stronger solutions of antiseptics and astringents is better adapted to chronic dysentery.

2. *Injections of large quantities* of water, containing astringents or antiseptics in solution, are employed to bring the drug in direct contact with the inflamed surface to be treated, both for the purpose of cleansing and of disinfecting the canal. The selection of the apparatus and also the method of its application are important. The tube to be used should be about twenty-four to thirty-six inches in length and No. 27 English (No. 41 French) in size; it should be flexible, and fenestrated on the sides, the openings being smooth and large; an opening on the end is worse than useless. The fluid to be used is to be introduced from a fountain or Davidson's syringe, or may be poured into a funnel attached to the end of the tube. This should always be done under low pressure and slowly, in order that the fluid may have time to distribute itself beyond the point of entrance. This will avoid the danger of overdistention and possible rupture of the thin-walled intestine when ulceration has occurred.

The question arises as to how far the tube should be introduced into the rectum—if it should go beyond the curve of the sigmoid flexure. It is very difficult to pass a tube beyond this point; it almost invariably turns on itself. Perseverance to this end would attain nothing, and there is danger of forcing the end of the tube through an ulcerated bowel into the peritoneal cavity. The fluid thrown into the rectum and sigmoid flexure will reach the colon. I have had the opportunity to demonstrate the facility with which this

takes place, in the case of a fæcal fistula in the cæcum following an operation for appendicitis. Colored fluid was forced into the rectum with a Davidson's syringe, and, under gentle pressure, escaped in half a minute through the fistulous opening in the right iliac region. Frequent repetition of this experience has proved, beyond doubt, that fluid introduced into the rectum attains the same result, as when the tube was made to reach the colon. In the case of an artificial anus in the upper third of the descending colon, due to malignant disease, the same facility of colon-irrigation was demonstrated.

Various mineral and vegetable astringents are employed by this method, the antiseptics being found more serviceable when used by irrigation. The rationale for the use of astringents is found in the resulting contraction of the injected blood-vessels, but they have no effect upon the disintegration of tissue nor upon the decomposition that is going on in the intestinal canal. For this purpose alum, lead acetate, and tannic acid are used, in strengths varying from 1 to 4 parts to 500 of warm or cold water. Silver nitrate is very much used, particularly where the ulceration is extensive. Tannic acid is especially advocated by Cantani, not only for its astringent properties but also as an antiseptic, and because it combines with the ptomaïnes and forms insoluble, harmless tannates. When using this method the need of injection under slow pressure is to be emphasized. The patient should lie on his left side, with the hips raised; the fluid should remain in the intestine five, ten, fifteen, or twenty minutes.

The favorable indications for continuance of the treatment will present themselves at once, the stools becoming less frequent, the foul odor, mucus, blood, and pus will disappear, and the fever and general symptoms improve. Where relapses have occurred after discontinuing this plan of treatment, return to it has soon brought relief and a termination of the disease.

Dangers from this form of treatment are the over-distention of the bowel and the possible retention of a large amount of fluid. In the first case there would be risk of rupture of the bowel as already stated, and the tormina will be increased by stretching. The object of ridding the bowel of decomposing fluid and its disinfection is not accomplished and the source of auto-infection is not removed by injection.

3. *Irrigation or Lavage of the Intestine.*—This form of treatment differs from the injection method in that the return flow of the fluid is provided for, and thus the bowel is emptied of its decomposing contents and the diseased surface kept clean, as an external wound would be under antiseptic methods.

A large flexible tube, No. 27 English (No. 41 French) in size, can be used for this purpose. It should be introduced high into the rec-

tum and the water or solution allowed to flow in. When about six or eight ounces of the fluid are introduced it should be allowed to escape. In this way the process can be repeated indefinitely, until the return is perfectly clear; usually not more than from two to four quarts are necessary. This has the advantage over the method already mentioned, in that it is less painful and obtains better results.

Two soft-rubber tubes may be used, passed side by side into the rectum, one for introducing the fluid (No. 17 English or 29 French in size) and the second two sizes larger being for the free outflow. The syringe should be attached to the smaller of the two and the fluid gently forced in. A current is soon established, and if this procedure is continued long enough considerable débris of membrane, fæcal matter, and blood and pus will be washed away. The returning fluid will be stained for some time, showing that not only is the rectum but also the colon being washed and cleansed of its contents.

Results obtained from this treatment show a lessening in the frequency of the stools; the character of the stool changes, putridity disappears, and the blood and pus diminish.

A cardinal point on which I have insisted in dysentery is that the rectum is like an over-distended bladder discharging its overflow, the contracting and irritable sphincter retaining a large residuum of decomposing fluid. The irrigation method removes this accumulation, evacuates the bowel and acts upon the causative agent of the disease. Marked benefit, reached in a short time, especially follows where there is extensive ulceration with large, foul-smelling stools, fever, tormina, and tenesmus. Such result could not be obtained by any other form of treatment. If the sphincter is irritable and the tenesmus great, one may follow the use of the irrigation with $\frac{1}{2}$ grain of the aqueous extract of opium in suppository. As improvement takes place this may be omitted except to quiet nervous irritability or induce sleep—for which purpose, though, the subcutaneous injection of morphine gr. $\frac{1}{8}$ to $\frac{1}{4}$, combined with atropine gr. $\frac{1}{150}$ to $\frac{1}{120}$, is more satisfactory.

The water used for irrigation should be about 100° F. and a sufficient quantity allowed to enter and escape until the returning fluid is clear; about two to four quarts usually suffice. The frequency of its use depends upon the severity of the case; ordinarily from two to six irrigations a day may be enough, intervals to be increased as improvement takes place; but when there is evidence of much ulceration, as recognized by the discharge and symptoms, the irrigation should be as frequent as every three hours.

Antiseptics are used by irrigation for the purpose of retarding the action of the micro-organisms, but more effect is obtained by the frequency of the irrigation than by any ascribed disinfecting quality of the drug used. Boric acid (5 to 10 : 500) is the safest and best; tan-

nic acid (1 : 500), salicylic acid (1 : 500), carbolic acid (1 : 2000), or naphthol (1 : 4000), are used in solution in the strength indicated. Hydrogen dioxide or salt may be used without any danger. Corrosive sublimate is dangerous, no matter in what strength it is used, as retention of the fluid may occur and poisoning follow. Osler has obtained good results from the use of quinine (1 : 5000 or 1 : 2500 or 1 : 1000), claiming that it rapidly destroys the amœba coli.

The astringents already mentioned may be specially and advantageously used by irrigation when the intensity of the symptoms has abated and the stools are more diarrhœal in character, or when the tendency of the disease is to become chronic. For continued ulceration, silver nitrate is particularly adaptable, stimulating the ulcers to heal; it is mildly antiseptic and astringent.

Continued experience with treatment by irrigation as here described, and the reports of the success of the method when employed by others have added to my faith in its value. The failure to obtain good results is due to improper or imperfect methods in carrying out the plan suggested or to a lack of perseverance.

Further treatment of the patient is symptomatic. For sleeplessness and pain, tormina and tenesmus, the use of morphine hypodermically is the only satisfactory remedy, and should be employed according to the absolute needs of the case, with the precautions already given. For pain in the abdomen, hot fomentations or poultices are often grateful to the patient. Measures for supporting strength and preventing failing action of the heart are a concentrated diet and stimulants, as brandy, ℥ss, every two hours, or strychnine, gr. $\frac{1}{60}$ to $\frac{1}{30}$, every six hours, or tincture of digitalis, gtt. v–x, or nitroglycerin, gr. $\frac{1}{100}$, every three to six hours. Solid food should be forbidden for some time, and liquid diet continued until the subsidence of all symptoms.

CHRONIC DYSENTERY.

This condition follows an acute attack; there is a chronic flux due to the persistence of unhealed ulcers. An imperfect cure often results from imprudence in eating and unwise management in convalescence. Severe attacks with deep ulcerations often lead to it. The delicate cicatrix which has formed may break down, when reopening of the ulcers occurs. These ulcers may vary in position, size, and number. There may be but one, or the whole colon may be studded with them, with intervening ridges of thickened tissue of polypoid formation as described by Woodward. The intestine is

uniformly dilated or contracted, or irregularly dilated and contracted. In the amœbic dysentery, amœbæ may be found in the contents of the intestine, in the walls of the intestine, or in abscess of the liver due to an embolic process.

The symptoms are frequent fluid or semi-fluid stools, containing mucus, blood, and pus in variable amounts; the stools may be lienteric and in other respects may resemble chronic diarrhœa. Borborygmi and tympanites accompany the diarrhœa, the appetite is variable, the tongue is red and glazed, and disordered digestion and hectic fever add to the debilitated condition. Emaciation and anæmia are extreme from innutrition. Occasional acute exacerbations occur, and the patients waste away and die from exhaustion or from one of numerous complications.

Treatment.

The best prophylactic measure is the care of convalescents from acute attacks. Too early exercise and the return to regular routine in life are to be delayed. A liquid diet, rest, and proper hygienic measures must be continued for months after severe acute attacks. When relapses occur the same measures and caution are to be adopted as in the original illness.

Change to a cool, dry climate, and rest from physical and mental strain, in those much weakened, are often necessary. When recurring attacks are frequent, prolonged rest in bed with attention to diet, in combination with other treatment, becomes imperative.

Diet.—Unless there is strict regulation of the diet, acute exacerbations may occur or the stools may increase and become bloody and purulent. For the capricious appetite and disordered digestion milk is best suited; peptonized milk or koumyss may be tried, and should be continued for several weeks; beef-juice, buttermilk, and matzoon may be alternated with these, and, as improvement takes place, concentrated animal broths, raw or soft-boiled eggs may be added gradually to the regimen of diet. Several months should elapse before a more mixed diet is given, and when begun should be of the most digestible foods, as raw oysters, raw scraped beef, chicken, sweetbreads, bread, rice, or other farinaceous foods.

Aids to digestion are especially needed: pepsin and dilute hydrochloric acid may be given after meals. Tonics, as iron, quinine, and strychnine, may prove of benefit, but relatively are of little value.

Where tympanites and evidence of decomposition from intestinal indigestion occur, then various intestinal antiseptics, such as bismuth salicylate, magnesium salicylate, benzo-naphthol, and others, may be of use. Attention to diet and rest, together with rectal irrigation, will bring about the best results attainable.

Irrigation of the Rectum and Colon.—The irrigation should be used as described for Acute Dysentery. Silver nitrate, in the proportion of gr. v–x to the pint, is the best remedy for persistent ulcers. When the ulcers are in the rectum and can be reached, local applications of a strong solution of silver nitrate, or pure nitric acid, should be used through a speculum, previously cleansing the surface by irrigation with water; after the application the rectum must be washed out with salt or bicarbonate-of-soda solution according to the remedy used.

THE INTESTINAL PARASITES.

By H. A. HARE, M. D.

Although many different forms of parasites have been found in the alimentary canal of man, there are only three varieties commonly met with in medical practice in this or other countries. Of these we find the tape-worm in its various kinds, the round worm, and the so-called thread-worms. The tape-worm (or *tænia*) and the round worm (or *ascaris lumbricoides*) are found in the small intestine if in their normal habitat, while the thread-worms (or *oxyuris vermicularis*) are inhabitants of the rectum. In addition to these common parasites we rarely meet with the *anchylostomum duodenale* and the *trichocephalus dispar*.

The tape-worm occurs as the *tænia mediocanellata*, which nearly always finds entrance into the body by reason of the eating of raw or imperfectly cooked beef; the *tænia solium*, which is usually found as the result of using raw pork; and the *bothriocephalus latus*, which finds its entrance into the alimentary canal by the patient having eaten raw fish infested by this parasite in its cystic stage. The latter worm is exceedingly rare in America, but the others are quite common, particularly the tænia solium, which is sometimes called *tænia saginata*. In addition to these worms we more rarely meet with the *tænia cucumerina*, which is the parasite often found in the intestine of the dog, and the *tænia flava punctata*, which has only been found as a parasite of man two or three times, although it is a frequently found parasite of the common rat. The *tænia nana* is equally rare.

Before discussing the treatment of a patient suffering from worms in the intestinal canal, the diagnostic facts in connection with intestinal parasites must be recalled. In the minds of the laity the fact that a child is nervous and irritable, picks its nose, or has running at the nose and eyes is "a sign of worms." Itching of the anus is another symptom regarded by the laity as an infallible diagnostic sign. It seems hardly necessary to point out that there is nothing pathognomonic in such symptoms, and that, while these symptoms may be present as a result of, or along with, the development of intestinal parasites, they are also manifest in full force in children who have chronic or subacute gastro-intestinal catarrh and are not infested by worms. The

only positive diagnostic point in deciding that worms are present is the discovery of a segment of the tape-worm or its eggs, or a round or thread-worm, in the stools; and this may, in the case of the round worm, really indicate that the patient has been freed from his parasite. On the other hand, it must be remembered that the round worm occurs in numbers rather than singly, and therefore the passage of one is a fairly reliable sign of others being present and justifies the use of an anthelmintic.

Aside from these facts in connection with diagnosis it must not be forgotten that tape-worm is capable of causing a more or less well developed anæmia; and a history of the ingestion of meat of doubtful character should cause a careful watching of the stools for segments and for the eggs, which are often passed in great numbers. These eggs should be sought for by the microscope or a powerful magnifying-glass, as they are very small. They are round and covered with a hard shell, which can be broken, and which, when broken, reveals a few hooklets. The egg of the tænia solium is slightly smaller than that of the tænia mediocanellata. The eggs of the bothriocephalus latus are very large, oval, light brown in color, and very easily broken. As the segments of the bothriocephalus latus are rarely shed, and as it is the form of tape-worm which produces the grave anæmia, just mentioned, in the majority of cases of parasitic anæmia, an examination of the fæces for its eggs is very important.

If the round worm be the parasite, it may on rare occasions crawl up into the stomach and be vomited by the patient; but this is a much more uncommon occurrence than charlatans and hysterical malingerers or insane persons would have us believe.

Treatment.

A very large number of remedies have been given for the removal of both the round worm and the tape-worm, but there are only a few which can be regarded as entirely reliable, and these will fail to produce the desired results if the physician administers them without taking certain precautions as to the time of their administration, the diet of the patient, and the treatment which is to follow the use of the anthelmintic.

After it has been decided that a vermifuge is needed the patient should take no food after his ordinary evening meal, and the next morning, before any nourishment is taken, the dose or doses of the anthelmintic should be given, and be followed every fifteen or twenty minutes by calomel in the dose of one or two grains until about 10 grains have been taken. From half an hour to an hour after the last dose of calomel and three or four hours after the last dose of the anthelmintic, a full dose of some saline purgative should be adminis-

tered, or in its place castor oil should be given in sufficient quantity to ensure a free movement of the bowels. Each movement of the bowels that takes place should be carefully inspected to discover whether any worms have been dislodged, as the diagnosis that the patient is a sufferer from worms cannot be considered as absolutely proved until a worm or some portion of a worm is expelled. In the case of the tape-worm the patient cannot be considered as relieved permanently unless the small head of the worm is discharged from the bowel; many feet of segments may be passed with only temporary relief to the patient, because the head of the worm has not been dislodged and will soon develop segment after segment, which will rapidly take the place of those which have been discharged. Whether the case be suffering from round worm or tape-worm the careful physician will also see that the patient receives immediately after the action of the purgative medicine a copious rectal injection of salt water in order that the bowel may be thoroughly washed out, and, in this liquid, when it is expelled from the bowel, there will be found quite frequently additional worms to those freely passed, particularly if the patient has suffered from the ascaris lumbricoides. If the tape-worm has been the infesting parasite the head will perhaps be washed out of the bowel by this means, and, as this worm is usually found singly, the passage of a head is a fairly certain sign of cure.

The remedies which we have mentioned as being the best for the removal of the *round worm* are santonin and spigelia. Santonin itself should always be employed in preference to the santoninate of sodium, which because of its solubility may be absorbed from the stomach or the upper portion of the small intestine before the worm has been seriously poisoned by it. The result of this absorption is that the patient experiences the full physiological effect of the drug and the worm is but slightly affected by the medicament; whereas, if santonin is given in its crystalline form, without being powdered, it is dissolved and absorbed so slowly that it comes in contact with the worm in full strength and speedily poisons it.

The dose of santonin for a child of five or six years is 1 to 2 grains, preferably given in capsules or in a troche. The dose for an adult is 4 to 5 grains, or as much as 8 grains may be given, but the latter amount is perhaps slightly beyond the line of safety and if administered should be followed within two or three hours at the most by a freely acting saline cathartic which will sweep it from the bowel before a sufficient quantity can be absorbed to seriously affect the general organism.

Spigelia is equally effective with santonin and is the safer drug of the two. Its fluid extract may be given under the conditions that we

have named in the dose from 1 to 2 drachms to a child, or, if an adult is affected, in the dose of 2 to 4 drachms. Very frequently it is advisable to combine this fluid extract with an equal quantity of the fluid extract of senna, since this mixture not only makes the worm let go its hold, but also moves the bowels and sweeps the parasite from the intestine before it can recover from the effects of the poison. Although spigelia when taken in overdose produces symptoms almost identical with those of belladonna, and although the symptoms may at times be quite alarming, it cannot be considered a very dangerous drug from a lethal point of view.

For the removal of the *tape-worm* there are three remedies which should always be preferred to all others, namely, pelletierine, the active principle of pomegranate, the oleoresin of filix mas or male fern, and that homely, but nevertheless efficient remedy, pumpkin-seed. We have named them in the order of their value. The pelletierine is always employed in the form of the tannate of pelletierine, the dose of which is from 3 to 5 grains, and practically the only preparation of pelletierine which is employed is that of Tanret, in which the alkaloid is put up in a syrupy solution in small bottles each of which contains one dose. The drug when absorbed, after being given in overdose, is capable of producing symptoms of serious poisoning due to paralysis of the peripheral ends of the motor nerves. When a full dose is given the physician should take care that the patient is freely purged within two or three hours afterward. The small size of the dose, the fact that it is not disagreeable to take, and the extraordinary power which pelletierine has in the poisoning of the tape-worm render it by all odds the most valuable anthelmintic for this form of intestinal parasite that we have.

On the other hand, it cannot be denied that aspidium or filix mas or male fern, as it is variously called, is also a very efficient remedy for the removal of the tape-worm. The dose of the oleoresin should be $\frac{1}{2}$ to 1 fluidrachm, given in small capsules, great care being taken that the patient is starved for a number of hours prior to its administration in order that the worm may not be protected by the presence of food and drink in the stomach and bowel, which will dilute the poison so that it is almost harmless to the worm. This remedy also should be followed by an active purgative, preferably one of the salines. It is a noteworthy fact that castor oil has been found to so increase the absorbability of the oleoresin of filix mas as to distinctly increase the danger of poisoning by this substance when it is given. Oily purges should therefore never be given when male fern has been used for the removal of tape-worm.

Pumpkin-seed, or as it is officially called, pepo, is often obtainable when these more refined anthelmintics cannot be had. The outer

coverings of the seeds should be removed and the remaining portion rubbed up into an emulsion, or be made into a paste which can be formed into an electuary by the addition of sugar. The dose of the seeds deprived of their outer coverings should be, for an adult, two ounces, and their administration should be followed in two or three hours by an active purgative. The large bulky doses necessary when pepo is used for the removal of tape-worm renders it disagreeable to most patients.

Thread-worms may be removed from the rectum by directing the patient's nurse or attendant to give a mild purgative followed by a copious injection of salt and water, or soap and water, to thoroughly cleanse and empty the bowel of fæcal matter. Immediately after this is done the rectum should receive by injection from a half to one pint of a decoction of quassia made by placing an ounce of quassia-wood chips or powdered quassia-wood in one and a half pints of water, and boiling it down to one pint. The patient should hold this injection for some minutes before passing it. If the bowel is thoroughly cleansed so that the worm is not protected by fæcal matter or mucus a very few such injections, given at several days' interval, will be most efficacious. Thymol solutions, and turpentine enemata of the strength of 1 drachm to the pint of soap and water, are also useful.

The *trichocephalus dispar* is so harmless that its presence is often unknown. It causes practically no irritation, but if it is to be removed copious quassia injections should be given.

The most important of the rarer forms of intestinal parasites is the *anchylostomum duodenale*, sometimes called *uncinaria duodenalis*. This parasite is usually found chiefly in the jejunum and is much smaller than either the round or tape-worm, the male being from 6 to 10 mm. and the female from 10 to 18 mm. in length. Although this worm is so small, its presence in the intestine in large numbers results in the speedy development of a profound anæmia in the patients infested by it. Indeed, the anæmia may be so severe as to result in death, and in Europe where the parasite has been spread by the employment of Italian and Polish laborers this form of intestinal parasite is not by any means rare. Infection usually occurs through the water-supply. It having been decided that the patient suffers from this form of intestinal parasite care should be taken that he does not infect others by depositing parasites in any place where they may infect the water-supply.

The diagnosis of infection by the anchylostomum duodenale can seldom be made by finding it in the fæces, for it rarely is discharged unless poisoned by drugs. The fæces always contain, on the other hand, large numbers of the eggs, which should be sought for in all

cases of persistent anæmia with a history of exposure. These eggs occur as unsymmetrical, thickly covered globules, and if the stools be placed in a warm spot the embryos can be seen to develop in the eggs.

The patient infested by the anchylostomum duodenale should receive full doses of thymol, as for example 30 grains in a cachet early in the morning and 30 grains two hours later, these two doses being followed in two hours by an active purgative. It is claimed that thymol is an absolute specific for the destruction of this parasite.

THE MODERN TREATMENT OF DISEASES OF THE SKIN.[1]

By H. W. STELWAGON, M. D.

Introductory Note.

Ointment Bases.—A few preliminary remarks as to the various ointment bases in common use will probably be of value to the general worker, and may be necessary for a clearer understanding of the remedial applications to be referred to in connection with individual diseases. The several ointment bases may be used more or less interchangeably, or they may be used in combination or mixture.

Lard—of good quality, fresh, properly prepared, and slightly benzoinated—is still a base for ointment which has not been supplanted.

Cold cream—unguentum aquæ rosæ—is an excellent base and may often be employed in place of lard, and is especially useful when a cooling effect is desired. Certain skins will admit of ointment applications only when made up with this latter base.

Petrolatum, or its variously named trade substitutes, has the great advantage of remaining free from rancidity, but it is not so softening as lard, or even cold cream, remaining more upon the surface as a thin coating; it is not agreeable, and may be even irritating to some skins. An ointment made with petrolatum will sometimes disagree, whereas the same medicament incorporated in lard or cold cream or mixed with another base will have a favorable effect. It is an especially cleanly base for ointments for the scalp.

Wool-fat, under the names of lanolin, agnine, adeps lanæ, etc., is

[1] Many remedies and some methods which have found space in the advertising columns of current medical literature during the past few years will not be found in this chapter: some for the reason that experience has demonstrated their unworthiness, and some for the reason that as yet their claim to be considered valuable has not been conclusively shown. In the pages at disposal it has been deemed to the best interests of the reader that the treatment of the principal diseases—diseases in which there had been probably some changes or additions in the therapeutical managment—be here presented from my own point of view and experience, which necessarily has assimilated much that my colleagues in dermatological work have found valuable. In addition, a number of the rarer diseases not considered in the former volume are briefly described, with the object of making the presentation of the subject of cutaneous diseases, as reflected by the entire work, as complete as space will allow.

sometimes used with advantage. It takes up a great deal of water, is alleged to have special penetrating power, and to be grateful to most people. It is somewhat stiff and tenacious, and should have incorporated with it 25 to 50 per cent. of petrolatum or 10 to 20 per cent. of some bland oil, such as the oil of sweet almond. It is somewhat questionable whether there is any superiority in a base so compounded over simple lard, petrolatum, or cold cream mentioned above.

When prescribing ointments which are to contain a proportion of liquid, it is advisable to have them made up with prepared suet or with simple cerate or lanolin, either entirely or partly depending upon the amount of liquid used.

In the following pages, when no special ointment base is mentioned it may be inferred that any of the first three named—lard, cold cream, or petrolatum—or a mixture of two or three—may be indifferently used, remembering that, when a penetrating effect is desired, lard or equal parts of lard and lanolin, or lanolin with a proportion of bland oil, should be prescribed; if mainly a protective action is sought, then petrolatum should constitute the greater or entire part of the base, with a proportion of wax or simple cerate to stiffen it if necessary; if a softening and cooling effect, then cold cream is the most efficient ointment base, with or without a small proportion of wax, according to circumstances. There are many other bases which may be used, but these several constitute the most valuable and are those commonly employed.

ACNE.

The modern treatment of acne places great stress, and very properly, upon the value of bodily exercise, especially out-door exercise, and careful attention to diet. All indigestible foods and stimulating drinks should be avoided. The bowels should be kept regular, with salines or vegetable laxatives, preferably the former. The patient's general health is to be rigidly examined into, and any other disease or faulty condition corrected. As the digestive system is mostly at fault, this should receive special attention. There are no specifics in this disease. At times it would seem as if calx sulphurata, in small doses, $\frac{1}{20}$ to $\frac{1}{2}$ grain thrice daily favorably influenced the pustular type, and that arsenic was occasionally of benefit in the sluggish papular variety. Ergot may be prescribed where atony of the muscular fibres of the skin is suspected. In cold, sluggish, indurated, and deep-seated types, more commonly seen in strumous patients, no remedy is comparable to small, continued doses of cod-liver oil.

Ichthyol, which has been greatly extolled, in doses of 3 to 15 drops three times daily, is of more than questionable value. Minute doses of bromide of arsenic, $\frac{1}{100}$ to $\frac{1}{50}$ grain three times daily, may be tried in obstinate cases. Small doses of corrosive sublimate and small doses of Donovan's solution seem to be of value in some cases in which sluggish, deep-seated suppurative action is pronounced.

Local treatment of acne is almost indispensable. The applications are usually made at night. Certain preliminary and concomitant procedures are, however, to be advised if a full effect of the local remedies is desired. The face is to be washed thoroughly with soap and water, rinsed carefully, and then sponged with hot water or steamed. It is then to be rubbed dry, with a pinching and kneading so as to obtain the favorable influence of massage also. The blackheads, or the most conspicuous of them, should be pressed out by means of the finger-ends or an instrument made for this purpose. The pustules may be advantageously opened and the pus ejected, the life of such lesions being much shortened in this way. Subsequent to these several preliminary measures the remedial application is made. If this latter is in the form of a lotion, it is to be thoroughly applied, so that if it contains a sediment a good deposit of the same will be left on the face. If the remedy has been incorporated in an ointment, a small quantity is placed on a piece of flannel and somewhat vigorously rubbed into the skin, afterward wiping off the excess. The application is to be allowed to remain on over night. In the morning the ordinary toilet washing is usually sufficient to remove what is left of the preceding night's medication. If the patient has decided to give himself over to treatment for a short rather than a longer time, the procedures of the night before may also be adopted in the morning. Ordinarily, however, patients prefer to dispense with morning applications. If after a few nights' use of the selected method a slight degree of irritation has been brought about, a mild dusting-powder of boric acid may be used after the toilet washing in the morning. If the irritation so produced should become very noticeable, or a mild exfoliation of the skin show itself, the treatment is to be discontinued for one or more nights and then resumed. In sluggish cases or in those cases desiring a rapid effect, instead of using a plain toilet soap the tincture of green soap may be substituted. If one remedy fails to bring about any improvement, or should the improvement cease, then another remedy is to be selected. Frequently a certain remedy or combination will benefit materially for a while, and its subsequent continued use fail. After substituting another remedy or combination for a time, recourse may often be had to the original treatment with again similarly favorable results. It is difficult to say in a given case whether ointments or lotions will prove the more satisfactory method

of treatment. Those having harsh and rather irritable skins will, as a rule, do better on ointments. The two methods, however, may often be usefully combined, first applying the lotion, allowing it to dry in, and then subsequently rubbing in the ointment; or they may be used on alternate nights.

The several external remedies most in vogue to-day are sulphur, resorcin, ichthyol, mercurials, and boric acid. Of these the most valuable by far is sulphur. It is used either in ointment form, 30 grains to 2 drachms to the ounce, or in the form of a wash. There are several sulphur washes which may be commended. One containing 2 or 3 drachms of sulphur, 10 to 20 grains each of camphor and tragacanth, and lime-water to make up four ounces—known as Kummerfeld's lotion—is often serviceable. Another with the same quantity of sulphur, and 4 drachms of ether and sufficient alcohol to make four ounces, is also a common prescription. By far the most valuable is a combination of zinc sulphate and potassium sulphuret, each $\frac{1}{2}$ to 2 drachms, to four ounces of water. Another of value is that known as Vleminckx's solution or liquor calcis sulphuratæ. This is to be used diluted with several parts of water, gradually lessening the proportion of water. Resorcin is employed in solution or ointment form, of the strength of 5 to 30 grains to the ounce. It may be advantageously prescribed in a compound prescription, made of a saturated boric acid solution, with 5 to 30 grains of resorcin, and 5 to 10 grains of zinc sulphate to each ounce. Ichthyol is of value in some cases; it is applied in aqueous solution or ointment, 5 to 25 per cent. strength. It may frequently be combined with sulphur in ointment form. Of the mercurials the oleate of mercury, corrosive sublimate, and calomel are the most valuable. Corrosive sublimate is prescribed as a lotion, $\frac{1}{2}$ to 2 or more grains to the ounce, and may often with advantage be added to the compound resorcin lotion already referred to. The oleate is used with an ointment base in 3 to 20 per cent. strength. Boric acid is extremely mild, but is useful in some cases. It is employed as a lotion, or more frequently the solution is used as the basis of a compound lotion. A lotion of this kind with 20 to 30 grains each of calamine and zinc oxide to the four ounces constitutes an excellent application for actively inflammatory, hyperæmic, or irritable cases, and is also useful when active remedies are temporarily suspended.

A plan of treatment which may be highly commended is that in which the skin is put slightly on the stretch and gone over somewhat roughly with a dull-edged curette. The tops of the lesions are in this manner scraped off and many of the blackheads forcibly expelled; hot-water applications should be immediately made to encourage the bleeding which usually follows. This procedure should be repeated

once or twice weekly till the skin is brought into a favorable condition. It is a harsh method, causing considerable pain and temporary disfigurement, and for these reasons comparatively few patients will submit to it. The effect, however, is often strikingly brilliant.

ALOPECIA (BALDNESS, DEFLUVIUM CAPILLORUM).

THE treatment of loss of hair varies somewhat with the cause of the affection. The alopecia or falling of the hair following the various systemic fevers and similar diseases will usually be followed by spontaneous recovery, or recover with applications of mildly stimulating lotions or ointments. The loss or thinning of hair occurring in the secondary stages of syphilis will usually be followed by a re-growth. In all cases of hair loss, however, the hereditary tendency of the family in this particular will exercise great influence upon the prognosis. In those cases in which the alopecia is a part or consequence of a long-continued or neglected seborrhœa, the removal of this latter disease will, as a rule, be followed by a new growth. In some of the cases the subsequent use of stimulating applications may become necessary before the hair shows a disposition to grow again.

There are certain constitutional remedies which have had more or less reputation in the treatment of simple uncomplicated cases. These are arsenic, sulphur, and pilocarpine. These are prescribed in moderate doses, and may be worth a trial in obstinate cases. Other internal treatment is sometimes advised, but only to meet any indications which should exist, such as general debility, anæmia, and the like. The most valuable external applications are sulphur ointment, resorcin lotions and ointment, quinine lotions, lotions containing the tincture of cantharides, and tincture of capsicum. The tar oils are among the most efficacious, but have a limited use owing to their odor. Naphthol, in the proportion of 20–60 grains to the ounce of ointment, is also a valuable stimulating application. The following are the several formulæ usually employed:

℞. Sulphur. præcip., ʒi–ʒij (4.0–8.0);
Acidi salicylici, gr. x (0.65);
Lanolin, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Glycerin, ♏x–xx (0.65);
Aquæ, q. s. ad fʒiv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Ol. ricini, ♏x–xx (0.65–1.3);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Resorcin, gr. xl–lxxx (2.65–5.2);
Quininæ, gr. xii–xx (0.8–1.3);
Ol. ricini, ♏x–xx (0.65–1.3);
Alcoholis, q. s. ad f℥iv (120.0).—M.

℞. Tinct. cantharidis, f℥i–viij (4.0–30.0);
Tinct. capsici, f℥ss–j (15.0–30.0);
Alcoholis, q. s. ad f℥iv (120.0).—M.

To this last, or to any of the alcoholic lotions, 10 to 25 per cent. of the oil of turpentine may be added. Crude petroleum is a good scalp stimulant, but is somewhat disagreeable to use.

These various applications should be thoroughly made, being well rubbed in. The friction employed is not without value. Indeed, systematic massage is itself of great advantage in the treatment of this condition.

During the period of active treatment shampooing will be more frequently necessary than at other times. The scalp should be shampooed, according to the necessities of the case, every one or two weeks; if the application is carefully made not much soiling takes place and a shampoo every two weeks will usually be found sufficient. For the shampoo, ordinary Castile soap, or one of the tar, sulphur, resorcin or naphthol medicated soaps, or the tincture of sapo viridis, may be used.

ALOPECIA AREATA.

Therapeutists differ somewhat as to the proper method of treatment of this disease, those viewing it as a parasitic disease relying upon external applications, and those looking upon it as a neurosis placing great stress upon the indicated constitutional remedies. These latter writers, however, consider local stimulation of the involved areas also of considerable value. Inasmuch as the stimulants used are almost all active parasiticides, it would seem an advantage to the patient to have the benefit of both external and constitutional treatment.

The systemic remedies upon which stress may be placed are arsenic, strychnine, quinine, iron and the hypophosphites. Other general remedies are, however, to be prescribed if indicated by the patient's

general condition. In short, the general health, especially as regards its nervous tone, should receive careful attention.

The external remedies which are in common use to-day are sulphur ointment, naphthol ointment, 1 or 2 drachms to the ounce, an ointment of oil of cade, 1 or 2 drachms to the ounce, and the oleate of mercury ointment, 5 to 20 per cent. strength. Chrysarobin is especially valuable, and is greatly in favor with those holding the parasitic view of the disease.

Of the liquid applications which are beneficial may be mentioned oil of turpentine, pure or weakened with a plain oil; oil of cade, pure or diluted with alcohol; tincture of cantharides. This last may be prescribed with an equal part of the oil of turpentine and oil of cade. Repeated paintings with tincture of iodine, or repeated blistering are both efficient, at times, in obstinate cases. Painting carefully with pure carbolic acid, not more than four square inches at one time, will act well in some instances; it is repeated, if necessary, once or twice, at the end of which time if a re-growth of hair has not shown itself, it should give place to another plan of treatment. Galvanization and faradization of the affected areas may also be used as adjuvants in rebellious cases.

DARIER'S DISEASE.

Darier's disease, or keratosis follicularis, is a rare affection of the skin characterized by pin-head to pea-sized grayish, dark red or brownish-red hard papules, usually with a central horny sebaceous plug. If the plug is squeezed or pinched out a small pit-like depression is noticed. The lesions arise from the sebaceous or hair-follicles. Usually discrete, although close together, they may here and there aggregrate so closely as to form more or less solid, rough, slightly or moderately scaly, warty patches. The progress of the disease is slow. In some cases papillomatous and more or less pedunculated growths are observed. The palms and soles when affected show more or less thickening, with at times punctate depressions.

It has been both affirmed and denied that the disease is a sporospermosis. An hereditary tendency has been noted in one or two instances.

Treatment has not been successful. Palliation is afforded by the plans of treatment adopted in ichthyosis.

DERMATITIS HERPETIFORMIS.

THE promise of a cure of this most obstinate disease cannot be too cautiously expressed. It is always rebellious and often extremely variable even under active treatment. The kidneys should be carefully examined, and in fact the whole patient is to be rigidly investigated. The disorder is, apparently, in many cases due to a chronically depressed nerve vitality. In some cases, especially the grave and pustular and bullous cases, septic conditions may by the responsible factors. On the constitutional management of these cases will depend the prospect of an eventual favorable termination. That the necessary co-operation upon the part of the patient is not always obtainable, or not for a sufficiently long period, will explain at least some of our failures in curing this disease. The diet should be full and nutritious but unstimulating.

The general treatment is based entirely upon indications. Arsenic long continued will in some cases make a favorable impress upon the course of the disease. Quinine in large doses, especially if a malarial poison is suspected, will also act favorably in a few instances. An active purgative two or three times weekly with a saline, concurrently with general tonic treatment, will act surprisingly well at times in mitigating an attack and favorably influencing the course of the disease. Strychnine in large and continued dosage should always be tried. Small doses of nitro-glycerin will occasionally appear to have a favorable action for a time at least. Phosphorus cautiously administered is also another remedy to bear in mind in the treatment of this intractable affection. Among the most valuable tonics may be mentioned cod-liver oil, iron preparations, and hypophosphites. Relief from business or worry of all kinds, and travel may be suggested in proper cases. Sleep-producing drugs, such as sulphonal, trional, phenacetin, the bromides, are necessary in many cases. Opiates are to be avoided, if possible, as the local irritation is often heightened in the after-effect.

Local treatment is always necessary in these cases, owing to the intensity of the subjective sensations of itching and burning. As a rule liquid applications are the most agreeable. The most efficient are those of carbolic acid, of liquor carbonis detergens, boric acid, thymol, thiol, ichthyol, resorcin. Several of these applications are also employed in the treatment of pruritus, to which the reader is referred for formulæ and proportions. Ichthyol, and also thiol, may be used diluted with 10 to 20 parts water. The lotion application may be supplemented with a dusting-powder of talc and zinc oxide, with or without an equal quantity of boric acid.

Mild alkaline baths, 2 or 3 ounces of sodium carbonate or bicar-

bonate to thirty gallons of water; baths of potassium sulphide, 1 to 2 ounces to the bath, prove useful in some cases.

Ointments often become necessary in the vesicular, bullous, and pustular cases. As a rule ointments are not satisfactory in the erythematous varieties. In the moist types Duhring speaks well of a sulphur ointment thoroughly rubbed in with sufficient friction to break down the lesions. It is a strong application and should be used cautiously at first. An ointment of the liquor carbonis detergens, 1 or 2 drachms to the ounce of simple cerate or prepared suet, is another application of value. An ointment of thymol, 5 to 30 grains to the ounce; and one made up with 10 grains of salicylic acid, 2 each of powdered starch and zinc oxide, and 10 grains of camphor, with sufficient petroleum to make an ounce, are both eligible preparations in some instances. The conjoint use, in these latter cases, of one of the above lotions and a supplementary mild ointment, as in the treatment of eczema, is a method which sometimes gives temporary relief to the local distress.

DERMATITIS REPENS.

THIS is a rare condition, usually having its starting-point at the point of a slight injury, and spreading gradually by a superficial serous or sero-purulent undermining, leaving a red, oozing inflammatory surface resembling eczema rubrum. It is slow in its progress, and is usually seen about the upper extremities. The subjective symptoms are slight. The true nature of the disease is not known, probably being at first neurotic with a subsequent parasitic infection. It is rebellious to treatment. Antiseptic remedies, such as boric acid, permanganate of potassium, resorcin, and the like have proved most effective. Crocker had a good result in one or two cases with the continuous application of lead lactate.

ECZEMA.

THERE are still conflicting views as to the management of eczema cases. There are those, fortunately a diminishing minority, who look upon eczematous eruptions, as indeed most skin-eruptions, as entirely independent of general or systemic conditions. Such consider the disease a purely local affection, and treat accordingly. That there are cases in which the causative element is seemingly purely local, and

which are responsive to external medication, every one with a large experience must admit. By far, however, the majority of eczema cases, for a successful termination require careful supervision of the patient's general health. Each and every case demands investigation as to the condition of digestion, as to the action of the kidneys, of the liver, and as to the proper functional activity of the other organs. A neurasthenic state is not infrequently a factor of etiological importance. A general debilitated state is also a not infrequent causative element. The condition known as struma is also a predisposing influence in some instances. The gouty and rheumatic diathesis is seemingly responsible for the chronicity of not a few cases. It will be readily seen that the plan of constitutional treatment must be varied according to the suspected or assumed predisposing factor. In all cases indigestible articles of food should be interdicted, and stimulants avoided.

As in the larger proportion of these cases the causes are found to be digestive, remedies such as strychnine, the bitter tonics, salines, and digestives, and the proper regulation of the diet are demanded. Anæmia is to be counteracted with such remedies as full doses of iron, manganese, arsenic, and occasionally minute doses of a mercurial. In anæmic cases, too, plenty of fresh meat should be allowed. Gouty conditions require the cautious use of colchicum, small doses of arsenic and the salicylates, along with the use of an alkaline mineral water taken freely. Rheumatic predisposition requires its special remedies, particularly the salicylates, along with occasional purgation, and plenty of water. Neurasthenia must be combated with the usual treatment and methods. For the strumous diathesis cod-liver oil in moderate dosage is most valuable, and its use in many cases, especially in children, cannot be overestimated.

There remain to be mentioned several remedies which at times seem to exert a specific influence. Arsenic is probably the most important of this group, and yet its failures may be counted by scores and its favorable influence by single cases. It is a disappointing remedy when given for its alleged specific influence. In small doses, however, it may often be given with advantage for its tonic effect. If the remedy has any special value it is in cases of a sluggish scaly and papular type. It should of course be tried cautiously in all cases seemingly suitable for its administration, along with the particular lines of treatment otherwise indicated. Viola tricolor is another remedy which occasionally, especially in the crusted types, exerts a special influence. The infusion or fluid extract is commonly prescribed, and in fairly full doses. The disease is sometimes made temporarily worse; the reaction, however, is favorable. The spirit of turpentine may also be tried, more particularly in extensive and

inflammatory cases. While it is being administered, water should be taken freely so as to inhibit or prevent any irritative influence upon the kidneys. The wine of antimony, in 5-minim doses three times daily, is also a remedy for the actively robust patient with the disease of an acute type. General galvanization and faradization, as well as the use of these currents directly to the diseased surface, have had supporters. Such plans are time-consuming and usually disappointing. Their possible good effects should, however, not be forgotten in the treatment of rebellious cases.

Before taking up the question of local treatment, a few remarks as to the use of water and soap, and to methods of application, particularly of ointments and washes: Water is not to be employed in acute eczema, and in most cases of subacute eczema as infrequently as possible. In fact, with few exceptions water is temporarily damaging in all cases of the disease. A little sweet oil or petrolatum may be used for cleansing purposes when desired. Occasionally, however, it will be necessary to employ soap and water for the sake of cleanliness, and also at times to remove the products of disease and any accumulation of the remedy. The soap, which should be a mild one, should be in scanty quantity, warm to hot water being employed, and then the parts thoroughly rinsed of all the soap, tapped dry with a soft towel or linen, and an ointment application immediately made. In cases in which the products of disease re-accumulate rapidly it may be necessary, for a time, to use soap and water every day or two. In cases of a sluggish type, with either crusting or scaling or simply considerable thickening, soap-and-water washings are sometimes used for therapeutic effect, and to thin down the outer skin so that the remedial application may be brought in more immediate contact with the disease. For this purpose also, as will be subsequently mentioned, sapo viridis is employed in place of a milder soap.

The method of applying ointments to inflamed eczematous surfaces has much to do with securing favorable results. When possible the ointment for the acute and subacute disease should be spread upon patent lint or suitable fabric and applied as a plaster, bandaging on if necessary. It may need to be changed twice daily—always once daily. At the time of changing, the parts should be either washed if deemed advisable or gently wiped with a soft piece of linen and a little sweet oil or petrolatum. In some instances it is best merely to gently wipe the surface with a clean rag and then re-apply the ointment. If plaster-like application is not convenient, the ointment should be applied by gently smearing over the parts a thin film; this should be done two or more times daily. In the subacute and chronic cases, in addition to the above methods of application which may in some instances be considered advisable, the selected ointment is to be

gently but thoroughly rubbed in, in the more sluggish cases using considerable vigor.

Washes or lotions, if free from sediment, may be applied with an atomizer, or a small quantity is poured out and is applied with a soft piece of linen or absorbent cotton. If the wash contain a sediment, the bottle should be well shaken, a small quantity poured into a small saucer as before, and applied in the same manner as just described. Another method of application when a more rapid effect is desired, and when circumstances permit, is to keep soft linen saturated with the prescribed lotion applied constantly, wetting it with fresh lotion from time to time as necessary.

The past ten years or so have seen many new external remedies introduced for which special value has been claimed in the treatment of this disease. Of these a few only have secured a permanent place in the therapeutical management of this disease. The belief in certain quarters in the parasitic origin has had no practical influence upon the external treatment. In fact, almost all the remedies heretofore and now used have possessed parasiticide properties. The principles of local management—mild and soothing protection, moderate stimulation, and active stimulation—of these troublesome cases should always be kept in view, and these principles are the keynotes to the treatment of to-day. For the acute disease, or for the acute type of the chronic disease, mild, soothing, astringent, and antiseptic applications should be employed. For the subacute type, whether the disease is of short or long duration, the same class of remedies will often prove curative; or more frequently it will be found necessary to have recourse to moderately stimulating remedies. For the chronic type—sluggish type—whatever its duration, strong applications will usually be found necessary to bring about a result.

Among the milder remedies in the average case nothing is comparable to a boric acid solution used conjointly with a mild salve, such as the oxide-of-zinc ointment, cold cream, plain petrolatum, or one of these with a small proportion, 10 to 25 per cent., of lanolin. The same holds true of lotio nigra, full strength or diluted with an equal part of lime-water, followed by one of the above salves. A very weak carbolic acid lotion, 1 to 3 grains of carbolic acid to the ounce, may be used in place of either of the above lotions. In the dry forms of the acute types a boric acid or a carbolic acid lotion, with a few minims of glycerin to the ounce, may often be used alone. Resorcin, 1 to 5 grains to the ounce, may be employed for the same purpose; so may also weak lotions of acetanilide. Diluted lead-water is also grateful in some cases. In addition to the several salves already mentioned as useful in the acute or inflammatory type may be mentioned the so-called salicylic acid paste:

℞. Acid salicylici, gr. x (0.65);
Amyli, ʒij (8.0);
Zinci oxidi, ʒij (8.0);
Petrolati, ℥ss (15.0).—M.

℞. Calaminæ, ʒj (4.0);
Ungt. zinci oxidi, ʒvij (28.0).—M.

℞. Liq. plumbi subacetat. dilut., fʒss–j (2.0–4.0);
Ungt. zinci oxidi, ʒiij (12.0);
Lanolin, q. s. ad ℥j (30.0).—M.

℞. Camphoræ, gr. v–x (0.3–0.65);
Acidi carbolici, gr. v–x (0.3–0.65);
Amyli, ʒij (8.0);
Zinci oxidi, ʒij (8.0);
Petrolati, ℥ss (15.0).—M.

℞. Acetanilid., vel aristol, vel bismuthi subgallat., gr. v–xx (0.3–1.3);
Ungt. zinci oxidi,
Ungt. aquæ rosæ, *āā.* ℥ss (15.0).—M.

Lotions which are of special value besides those already mentioned are:

℞. Calaminæ vel zinci oxidi, ʒj (4.0);
Glycerini, ʒss (2.0);
Aquæ, ℥vj (180.0).—M.

℞. Thymolis, gr. vj (0.4):
Sodii borat., gr. ij (0.1);
Acidi borici, ʒiss (6.0);
Liquor. calcis,
Aquæ, *āā.* fʒiij (90.0).—M.

Liquor carbonis detergens, 10 to 60 drops to a small teacupful of water, dilute lead-water, weak solutions of zinc sulphate ($\frac{1}{4}$ to 1 grain to the ounce), and similar mild astringent remedies, are also useful.

Coming into the domain of the treatment of cases of the subacute or mildly inflammatory type, a little more freedom as to the use of stronger applications is permissible. It is, however, a good rule to begin the treatment of all such cases with the mildest kind of remedies, and then gradually increase the strength of applications. The remedies already enumerated are employed also in this type, at first preferably of the strength already indicated, and then if there is no response, or improvement hesitates, increasing the proportion of the active ingredient. This list may, however, be considerably added to.

The various mercurials, in ointment form, more especially calomel, white and red precipitate, oleate of mercury, of from 1 to 5 per cent. strength, are often extremely useful. Resorcin, 5 to 30 grains to the ounce of ointment; alumnol, 20 to 30 grains to the ounce; acetanilide, 10 to 30 grains to the ounce; aristol, about the same proportion; tar ointment 1 part, simple ointment or oxide-of-zinc ointment 7 parts, liquor carbonis detergens, one-half to one drachm to the ounce of ointment, oil of cade in the same proportion, sulphur 3 to 30 grains to the ounce, may be used in this type, occasionally with striking advantage.

Coming to the treatment of the sluggish type of the disease, much stronger preparations may have to be called upon. The strength of those already named may be cautiously increased. In addition to these, however, may be mentioned, an ointment of pyrogallic acid, 5 to 40 grains to the ounce; an ointment of chrysarobin, of the same strength; an ointment of liquor picis alkalinus, $\frac{1}{2}$ to 2 drachms to the ounce; strong salicylic acid ointments, 5 to 15 per cent. strength. Paintings with salicylated collodion, 10 to 40 grains to the ounce, or the painting on of a gelatin film similarly medicated, or the application of the remedy in the form of a rubber or gutta-percha plaster, will be found variously useful. A vigorous shampoo with sapo viridis, followed by a mild or moderately strong ointment application, is also valuable in thickened, sluggish types. In the latter type the salicylic acid rubber or gutta-percha plaster, 5 to 25 per cent. may often be used temporarily. Shampooing with sapo viridis and allowing the lather to remain on a few hours or longer and then following with an ointment may also be tried in the same class of cases. Frequently these stronger applications are to be used to bring the thickened patch into active irritation, the subsequent application being mild to moderately strong; the result of this method is often satisfactory. In the chronic types the tarry applications still occupy a conspicuous place; they should always, however, be used cautiously at first, as certain skins are intolerant.

In the above *résumé* of the methods in ordinary use to-day in the treatment of eczema, nothing has been said as to the treatment of the disease as it occurs on the various regions of the body. This is for two reasons: one being that regional eczema has received extended consideration in the original publication, to which the reader is referred, and the other the fact that the principles of treatment and the remedies employed are the same whatever the part affected. Both circumstances and region affected, it is true, have some influence on the remedies selected, especially as to strength, and on the method or manner of application, but only such changes or modifications as will readily suggest themselves.

ECZEMA SEBORRHOICUM.

UNDER this head, as remarked in speaking of seborrhœa, there has been a tendency to relegate all cases of this latter disease, also some cases which have heretofore been considered rather anomalous psoriatic cases, and some cases of eczema. The cases from these two latter diseases are those in which there is a decided greasy character to the crusts and scales and a tendency to form segments or ring-like patches. The treatment here considered will refer to all the above cases except those cases of seborrhœa in which the inflammatory signs are, seemingly at least, absent. The most valuable remedies are sulphur, salicylic acid, resorcin, pyrogallic acid, and chrysarobin. The mercurials, especially calomel and the oleate, are also beneficial. Sulphur is employed in ointment in 5 to 25 per cent. strength; salicylic acid, in ointment, 10 to 30 grains to the ounce; resorcin, either in alcoholic or aqueous solution or in ointment, 5 to 30 grains to the ounce, as advised in seborrhœa. Pyrogallic acid is resorted to in the more obstinate cases, using it as an ointment, 5 to 60 grains to the ounce. Chrysarobin is likewise employed in the rebellious cases, about the same strength as the pyrogallic acid. These stronger applications are sometimes advisable in order that a moderate or severe degree of inflammatory reaction may be brought about, the subsequent treatment being of a mild character. This disease is looked upon as parasitic and contagious by the few gentlemen who have written most about the subject. The older dermatologists have, for the most part, failed to be convinced of the contagiousness of the disease, their experience not supporting such a belief.

As to constitutional treatment the strongest advocates of the entity of this disease place essential importance upon external treatment alone. It is advisable, however, to look into the general health of these patients. The effect of local treatment will certainly not be retarded, it will often be materially enhanced, by appropriate systemic medication, more particularly of a tonic nature, with the occasional use of saline laxatives.

EPITHELIOMA.

THE milder types of epithelial degeneration only, as a rule, fall to the care of the dermatologist or general practitioner, and the treatment here outlined refers more especially to such cases. The superficial form of the disease (rodent ulcer), which more especially interests us, may exist for years and give rise to no alarm, but there is

always the possibility of its assuming a more malignant phase, and therefore treatment is advisable in all cases. The object of treatment —the destruction or removal of the epitheliomatous or suspected tissue—must not be lost sight of. Whether from incomplete removal or from independent degenerative action, recurrences at the seat of the former lesion are not uncommon. The removal of the diseased tissue may be brought about by the use of such caustics as potassium hydroxide, pyrogallic acid, and the galvano-cautery, and also by means of the curette, and by excision. Various other caustics, as Vienna paste, zinc chloride, arsenical paste, and the like, have also been used from time to time.

The best plan of treatment, if the growth is small and well defined, is excision, bringing the parts together with one or two stitches if necessary, or by adhesive plaster. If the area involved is too great to permit of this method, thorough curetting is advisable; this should be supplemented by momentary cauterization with potassium hydroxide or a strong solution of zinc chloride; if the former is used, its action should, after a minute or two, be neutralized by the application of vinegar or dilute acetic acid. If operative measures are objected to, or if for any reason they cannot be employed, resort must be had to the caustics. For the small superficial and recent lesion, potassium hydroxide may be employed, either in strong solution or as the stick. It should be thoroughly applied for a fraction of a minute or so, the sloughing coat rubbed or picked off as much as possible, and the caustic re-applied; after sufficient action has taken place, vinegar or dilute acetic acid is to be applied as indicated. If the growth is larger, and even in that variety already named, a stiff ointment of pyrogallic acid may be used. A good formula is as follows:

℞. Acidi pyrogallici,	ʒij (8.0);
Emplast. resinæ,	ʒiss (6.0);
Cerat. resinæ,	ʒivss (18.0).—M.

This is to be spread on suitable material and closely applied; it is to be changed twice daily, each time washing the part with warm water, and gently removing as much slough as may have been produced—as much as can be removed by gently rubbing with cotton or a piece of cloth. This treatment is to be continued for from one to three weeks, ten days usually sufficing to produce sufficient destruction. At the end of this time the ointment is reduced to 10 grains of pyrogallic acid to each ounce, and healing is allowed to take place. At times, instead of rubbing off or trying to pick off the slough produced by the caustic ointment, this may be intermitted every few days, and poultices applied for several hours or more till the slough comes

away. In other cases, and in fact in all if the area is not larger than a square inch, the application of an arsenical paste is an admirable method of treatment. The lesion should be freed from any crusting, and then a thick paste made of one part of arsenous acid, two parts of powdered acacia, and sufficient water, thickly applied; over this is placed a piece of patent lint or kid. The paste hardens and makes a firm and adhesive dressing. More or less severe pain is likely to be present in the course of a few hours, or half a day, accompanied with œdema and swelling. The application should be allowed to remain on for from twenty-four to forty-eight hours. If the destructive action has not been sufficient a second application of the same kind should be made; subsequently the part is poulticed till the slough comes away. The after-dressing or treatment of these cases depends somewhat upon the method of removal that has been employed. If this has been effected with the knife or the curette, ordinary antiseptic dressings are to be advised; if with potassic hydrate or pyrogallic acid ointment or the arsenical paste, the same dressing may be employed, or an ointment of pyrogallic acid, from 1 to 2 per cent. strength, or simple resin cerate, with from 5 to 10 grains of carbolic acid to the ounce.

ERYTHRASMA.

This disease presents a symptomatology closely similar to that of tinea versicolor. The disease is, however, usually more or less confined to the folds, as at the axillæ, cruro-genital fold, and cleft of the nates; from these situations it is apt to extend to the immediate surrounding neighborhood. The eruption is not abundant as a rule, consisting of rounded or irregular, well-defined patches slightly purpuraceous, first somewhat pinkish or red, later of a yellowish or brownish tint. It is slow in its progress, lasting for years, and exhibiting no disposition to spontaneous disappearance. Slight itching may occasionally be present. It is due to a vegetable parasite, *microsporon minutissimum*. The therapeutic management is the same as that of tinea versicolor.

ERYTHEMA INDURATUM.

Erythema induratum, the *érythème induré scrofuleux* of Bazin, usually consists of one or several rather deep-seated nodules or circumscribed infiltrations occurring about the lower leg, especially in

the calf region. The disease has also been observed upon the arms. The overlying skin may be entirely normal in appearance or (as it usually becomes) of a livid hue. The process is slow, absorption taking place, or, as generally happens, the indurations gradually break down, resulting in a deep-seated, punched-out ulcer. The condition is not syphilitic, although the ulcers strongly suggest it. It is apparently tuberculous, being seen in strumous subjects, especially girls and young women. The disease is rebellious. The best plan of treatment consists in the applications of mildly stimulating antiseptic ointments and lotions, such as resorcin, boric acid, calomel, oleate of mercury, and aristol. A good method is to thoroughly cleanse out the ulcers with a solution of boric acid and resorcin, and then apply a mild ointment of resorcin, or aristol, or boric acid. In obstinate ulcers curetting may be resorted to. Rest, with the leg in the horizontal position, is more potent than drugs. The constitutional remedies to be prescribed are cod-liver oil and iron, with plenty of nutritious food. Phosphorus has acted well in one case of erythema induratum, but should be given cautiously.

HYDROA ÆSTIVALE (HYDROA VACCINIFORME; HYDROA PUERORUM; RECURRENT SUMMER ERUPTION).

This disease is seen in childhood and early youth, and is recurrent during the same and the following summers. The disposition disappears toward the age of manhood. The manifestation consists of vesicular lesions, somewhat vacciniform in appearance and almost invariably leaving scars. It is seen chiefly on exposed parts. The attacks usually come on after exposure to the sun and wind in the warm season. It first appears as red spots upon which single or several small vesicles develop, sometimes becoming sero-purulent and purulent, drying off gradually and leaving behind a depressed, small-pox-like scar. General symptoms of malaise, anorexia, and rheumatic pains and swellings may usher in the eruption. The attack runs its course, as a rule, in a few weeks. All recorded cases have been males, and young. The nature of the disease is not known.

The treatment consists of the application of the mild antiseptic remedies which are employed in acute and subacute eczema. Exposure to sun and wind and even to great artificial heat should be avoided. Internally, arsenic and quinine have received the most favor.

HYPERIDROSIS.

THE treatment of general hyperidrosis consists in removing or remedying the associated or underlying disease. Existing independently, the management is the same as that for the local forms. Of these latter—hyperidrosis of the hands, especially the palms, hyperidrosis of the feet, especially the soles, and hyperidrosis of the axillæ—that of the feet and soles comes most frequently for medical relief. In some of the cases, probably from a development of the *bacterium fœtidum*, the sweat becomes of an extremely fœtid odor (bromidrosis, osmidrosis).

Chief reliance is to be placed upon external applications, although any existing faulty condition in the general health is to be corrected. There are several systemic remedies, however, which are thought at times to have a specific influence, and which should, therefore, be prescribed in urgent or obstinate cases. These are ergot in full doses, strychnine, belladonna or its alkaloid atropine, aromatic sulphuric acid, agaric, pilocarpine, and sulphur. This last is given in teaspoonful dose morning and evening, and its laxative action limited, if necessary, by some mild astringent.

As to local treatment, dusting powders are of value, the most efficacious being—

℞. Acidi borici,	ʒj (30.0).
℞. Acidi salicylici,	gr. x–xxx (0.65–2.0);
Acidi borici,	ʒj (30.0).—M.
℞. Bismuthi subnit., vel tannin,	ʒj (4.0);
Acidi borici, vel talci Veneti,	ʒj (30.0).—M.
℞. Acetanilid.,	gr. xx–lx (1.2–4.0);
Acidi borici,	ʒj (30.0).—M.

The selected powder should, after a soap-and-water washing, be freely dusted over the parts and also into the socks or stockings. Cork inside soles should be worn, and should be washed daily in boric acid solution. Lotions of alum, zinc sulphate, tannin, 1 to 5 per cent. strength; a 1 to 2 per cent. alcoholic solution of quinine or acetanilide, tried alone or conjointly with one of the above dusting-powders, are also beneficial. In more obstinate cases, strapping with soap-plaster will be found useful. Salicylated mutton suet, 2 per cent. strength, applied daily, is also valuable. In extreme cases of hyperidrosis or bromidrosis of the feet the continuous application of diachylon ointment or a 10 to 20 per cent. tannin ointment, changing twice daily

for a period of two or three weeks, will frequently relieve and cure. In this latter method soap-washing should be for the time, except as a preliminary measure, avoided, the parts being wiped clean at each change of the ointment, with a soft towel and dusting powder. Finally, a trial may be made of faradization and galvanization of the affected parts.

LEPRA (LEPROSY; ELEPHANTIASIS GRÆCORUM; LEONTIASIS).

In the general mind leprosy has always been considered incurable, but there are recorded cases in which the disease was halted in its progress and also permanently relieved. This possibility should be recognized in every case, and proper and energetic measures persistently advised and carried out.

In the constitutional treatment, irrespective of remedies that may from time to time be indicated by accidental conditions, three drugs have gained considerable reputation as having special influence—strychnine, gurjun-oil, and chaulmoogra-oil. These should be tried in increasing doses. In addition to medication, hygienic measures are of great importance. The removal of the patient to a climate or country where the disease is not endemic or does not exist is a measure of great value. Ichthyol and other drugs have been variously advised, but the three named are those from which the most satisfactory results have been derived.

Externally, the oils mentioned, as well as ichthyol, pyrogallic acid, resorcin, and chrysarobin, have been extolled, applied usually in the form of an ointment in about the same strength as employed in psoriasis. It is generally recognized, however, that the external treatment is rarely more than palliative, and that it is to be employed or not according to the indications.

LICHEN PLANUS.

This disease is seen most frequently in those of nervous temperament and in the neurasthenic class. The constitutional remedies must be directed toward improving the general nutrition and an invigoration of the nervous energy. For this purpose the ordinary tonics, iron, quinine, strychnine, cod-liver oil, and arsenic, are the available remedies. Arsenic and iron are the most important, the former especially often exerting a positive curative influence. It

should not, however, be administered in too large doses; it rarely benefits if no impression is made with 5-minim doses thrice daily. It may be given with advantage, especially if an excitable state of the nervous system exists, with the fluid extract of lupulin. A liberal diet should be permitted, and a little Burgundy at dinner allowed. Or, in place of this last, a tablespoonful of the wine of beef and iron may be administered after each meal.

Local treatment is of great importance. The most valuable remedy in my experience is liquor carbonis detergens—a solution of coal-tar in the tincture of soap-bark. It may be prescribed in ointment, 1 or 2 drachms to the ounce of simple cerate or prepared suet; or it may be used as a wash, with several or more parts of water, increasing the strength, even up to the pure solution if irritation is not produced. Tar in other forms is also beneficial, but the coal-tar solution has not the same disadvantages for private practice that the other tarry preparations possess. An ointment of carbolic acid and thymol, of each 5 to 30 grains to the ounce, may also be employed with advantage. An ointment of carbolic acid 20 grains, corrosive sublimate $\frac{1}{2}$ to 1 grain, and oxide-of-zinc ointment 1 ounce, is largely used, although it has not been particularly serviceable in my hands. The carbolic acid washes and the zinc and calamine lotions mentioned in eczema are also of value.

In obstinate cases strong stimulating applications are necessary; for this purpose a mixture of equal parts of liquor carbonis detergens, tincture of green soap, and liquor calcis suphuratæ, may be tried, rubbing it in twice daily, and following with mild applications should active irritation result. In extreme cases bran and alkaline baths are serviceable and give relief to the burning and itching.

LICHEN SCROFULOSUS.

This is a rare affection of the skin seen in scrofulous subjects, and consists of small, mildly inflammatory papules tending to form irregular and crescentic groups. The papules vary in size from a pin-point to a pin-head, and are, when fully developed, of a yellowish red or fawn color. The older papules are usually capped with a minute scale. The lesions are slow in development and may remain for months; new lesions arise, and the disease is thus kept up almost indefinitely. After the typical eruption disappears, slightly yellowish spots remain. The trunk is the usual site for the disease. A few acne-like papules or pustules may be present. The pathological condition consists of cell-infiltration of the papillæ immediately surrounding the follicle. Treatment is always followed with favorable result.

This consists of the administration of cod-liver oil and the application, by gently rubbing in, of a mildly or moderately stimulating application, such as a mild resorcin, tar, or sulphur ointment.

LUPUS ERYTHEMATOSUS.

Lupus erythematosus is not only a stubborn and chronic disease, but it is often strikingly capricious. A patch may after weeks or months spontaneously disappear, new patches arising from time to time. The disease usually leaves behind a thinned or atrophic condition of the skin, but it is to be borne in mind that its disappearance may take place without a trace. This fact is not to be lost sight of in the medicinal management of the disease. In short, destructive or operative methods or any method which will leave scarring as a result should not be employed except in the persistent and rebellious disease, especially in those cases which show no tendency to spontaneous involution. There are two visible factors in a case of lupus erythematosus: one is the inflammatory or hyperæmic element, and the other is the cell-growth or infiltration. In the cases of the former class the mildest kind of application should at first be employed, gradually having recourse, should these fail, which they often do, to stronger remedies. In the conspicuous cell-growth or infiltration varieties or types a more stimulating plan of treatment may usually be prescribed from the start.

A few words first as to constitutional treatment: The true etiology of the disease is not known. It has been alleged that it is allied to lupus vulgaris in having the tubercle bacillus as the cause, but the overwhelming consensus of opinion is against such a view. The patient's general health should be investigated, and any needed remedies prescribed according to indications. There are several drugs which have, in some instances, seemed to exert some influence. These are cod-liver oil, the iodides (especially the iodide of starch), phosphorus, and arsenic. In some cases there seems to be some digestive or assimilative irregularity; in such, saline laxatives, along with stomachics and digestives with strychnine, at times make a favorable impression upon the activity of the disease.

Recurring to local treatment, among the most valuable mild applications may be mentioned—

℞. Zinci oxidi,
Calaminæ, āā. ʒj (4.0);
Zinci sulphat., gr. xx–xl (1.3–2.6);
Glycerini, ♏xx (1.3);
Aquæ, fʒiv (120.0).—M.

℞. Acidi borici, ʒj (4.0);
Resorcin, ʒss–ʒij (2.0–8.0);
Zinci sulphat., gr. xx–xl (1.3–2.6);
Aquæ, f℥iv (120.0).—M.

℞. Zinci sulphat.,
Potassii sulphuret, *āā.* ʒss–ij (2.0–8.0);
Aquæ, ℥iv (120.0).—M.

℞. Sulphur præcip., ʒij (8.0);
Zinci sulphat., gr. xx (1.3);
Tragacanthæ, gr. xxx (2.0);
Aquæ, ℥iv (120.0).—M.

A method of treatment which is not without value in some cases is that which consist in nightly shampooing the affected parts with the tincture of green soap, rinsing, and following with one of the several lotions already named; or, if there is a good deal of irritation, following with some mild salve, such as cold cream or oxide-of-zinc ointment. If after a time the soap-washings are not followed by any cutaneous irritation, or should that be the case from the first, it may be followed with a stronger ointment application such as—

℞. Ungt. sulphur præcip., ʒj–ij (4.0–8.0);
Aquæ rosæ, ʒvj (24.0).—M.

℞. Hydrarg. oleat. (20 per ct.) ʒij–iv (8.0–16.0);
Cerat. simplicis, ʒij (8.0);
Petrolati, q. s. ad ℥j (30.0).—M.

℞. Ol. cadini, ʒj (4.0);
Cerat. simplicis, ʒvj (180.0).—M.

℞. Aristol, gr. xx–lx (1.3–2.0);
Petrolati, ℥j (30.0).—M.

Painting the parts with a medicated collodion:

℞. Acid. salicylici, gr. xx–xxx (1.3–2.0);
Zinci oxidi, ʒss (2.0);
Calaminæ, gr. x (0.65);
Collodii, ℥j (30.0).—M.

is sometimes of material advantage.

Among the stronger applications which may be used alone or in conjunction with ordinary toilet washing, or following the washing with the tincture of green soap, may be mentioned the oil of cade

(pure), strong tar or sulphur ointment, an ointment of pyrogallic acid, 10 to 40 grains to the ounce, a strong calomel or white precipitate ointment, 40 to 80 grains to the ounce.

The stronger applications which may be required are a salicylated collodion, 20 to 60 grains to the ounce, collodion medicated with resorcin, 2 to 10 per cent. strength, beginning with the weaker. Pyrogallic acid may also be used cautiously in the same manner, 10 to 40 grains to the ounce. Painting the parts over with pure liquid carbolic acid, and repainting again a day after the crust thus formed has fallen off is valuable in some cases, although somewhat painful. The cautious application of arsenical paste or ointment, or the caustic pyrogallic acid ointment, referred to in the treatment of lupus vulgaris, may be used. Such strong applications should only be employed in obstinate and unyielding patches, as a variable amount of destructive action follows their use. Salicylic-acid-creasote gutta-percha plaster is of advantage in such cases, the destructive action being usually slight.

The operative plans may also be resorted to in this latter class of cases. Repeated linear scarification, as in lupus vulgaris, is much more applicable in this disease. If the patch is small, curetting, with subsequent slight cauterization, as in lupus vulgaris, is also a valuable method. The actual cautery, Paquelin cautery, or, best of all, the galvano-cautery, may be employed when destructive methods are deemed advisable. It has seemed to me, however, that these cautery methods are more apt to be followed by keloidal tendency.

LUPUS VULGARIS.

THAT lupus is due to the invasion of the cutaneous tissue by the tubercle bacillus is now pretty generally admitted. Constitutional treatment is, therefore, relatively of little importance compared to local treatment. In some cases, however, certain constitutional remedies appear to have a favorable influence upon the progress of the disease, and to aid materially in maintaining the effect produced by local measures. Cod-liver oil in continued and moderate dosage is the most valuable of this class. The iodine and iron preparations are also of value in some instances. The treatment by hypodermic injections of tuberculin, 1 to 2 milligrammes at each injection, repeated at intervals of several days to a week, is a method that may be employed as a *dernier ressort* in severe and obstinate cases, either alone or (preferably) conjointly with a thorough curetting or cauterization. It should not be used if there is a suspected dormant tuber-

culous deposit in the lungs or any other organ, and the proper antiseptic precautions are to be scrupulously observed.

Owing to the observation, now several times made, that an accidental erysipelas sometimes cures an existing lupus, the artificial production of this disease by inoculations of the products of benign erysipelas has been advised. The resort to such treatment would not be without positive danger, and would not be justifiable except in rare instances. It is of course understood that whatever plan of treatment is pursued, the patient is to be placed in the best condition of health possible, with plenty of fresh air, exercise, and nutritive food.

The plans of treatment of lupus most practised to-day are those in which operative measures figure largely. Before referring to the several operative methods in vogue, reference to the milder or non-operative plans occasionally adopted may be briefly mentioned. There are two elements to be considered in an average case of moderately advanced lupus: one is the inflammatory element, and the other the new cell-growth. The various soothing applications described in the treatment of acute and subacute eczema will in some instances have a material influence on the former and in this manner lessen the conspicuousness of the lesions. Actual improvement in the disease itself is exceptionally noticed even in this method of treatment; permanent improvement with such applications is, however, hardly to be anticipated. Stimulants, which for the most part are parasiticides, will in a few instances exert a favorable influence upon the course of the disease. Of the last class of remedies the mercurials are the most valuable. An ointment of the oleate of mercury, 5 to 25 per cent. strength, or one of corrosive sublimate, $\frac{1}{2}$ to 2 or more grains to the ounce, mercurial plaster, and corrosive sublimate lotions, $\frac{1}{2}$ to 2 grains to the ounce, have all been of proved value in some cases.

As to the destructive methods of treatment one of two plans may be adopted, or they may be employed conjointly. The several caustic methods advised by different dermatologists to-day are: A gutta-percha plaster containing 10 to 25 per cent. salicylic acid and the same, or a greater quantity percentage, of creasote; an ointment of pyrogallic acid, 25 per cent. strength; arsenous acid, 10 grains, cinnabar, 20 grains, and simple ointment, half an ounce. These several caustic applications are kept constantly applied, a fresh application being made at least once daily. After a certain number of days, about ten days to three weeks, with pyrogallic acid ointment, about the same time with the salicylic acid combination, and after three or four days with the arsenical ointment, the treated parts are poulticed for twelve to twenty-four hours to remove the slough, and a mercurial ointment or plaster applied. Several repetitions of these caustic

methods must often be made before complete recovery takes place; and in some cases the result is not very satisfactory. Other methods of cauterization are: with the actual cautery, the galvano-cautery, and the Paquelin cautery.

Of the operative methods the one most generally employed is that which consists of thoroughly curetting the diseased tissue. After this a mercurial plaster is applied, or what is certainly of greater value, pyrogallic acid ointment for several days, and subsequently the mercurial plaster. Linear scarification is another favored method —rather tedious, but with good cosmetic results. The part is thoroughly cross-hatched with a sharp bistoury, single or multiple, the incisions being close together; this is followed by mercurial plaster. At the end of one or two weeks the same procedure is again practised, and so on till the result justifies its discontinuance. Recurring isolated tubercles in the scar or at the edges of the original area may be treated by boring into them with a pointed stick of silver nitrate, or by boring into them with a dental burr; or the curette may be used for their removal.

MYCOSIS FUNGOIDES.

This disease has been described under various names, such as "granuloma fungoides," "inflammatory fungoid neoplasm," "*lymph-adénie cutanée*," "sarcomatosis generalis." The disease is insidious and chronic, being slowly progressive, and with two exceptions ending, after a variable number of years, fatally. It begins with symptoms of an eczematous, urticarial, and erysipelatous nature, which may be somewhat capricious and irregular and last for some weeks or years. Itching is apt to be a troublesome symptom. Later other symptoms are added; papular and tubercular and tumor-like elevations present themselves, of a pinkish or red color, some becoming ulcerative and fungoidal. These growths, which may be quite imposing in character and size, occasionally undergo resolution and disappear. New growths, however, make their appearance from time to time and may exist in profusion. Exceptionally the disease begins with the appearance of new growths. Finally, from gradual exhaustion and the supervention of septicæmic symptoms, the patient succumbs. The true nature of the disease is not known. The only recoveries have resulted from the administration of arsenic, preferably by the hypodermic method. Otherwise treatment, both local and constitutional, is based upon general principles.

PITYRIASIS RUBRA PILARIS (*Devergie*).

THIS is a rare disease, characterized by a dry scaly follicular eruption, which may be somewhat limited or may become more or less general. In cases of the limited disease the most striking features are the follicular papules and moderate scaliness, variable infiltration or thickening, with a harshness and accentuation of the lines of the skin. In the extensive cases these same features obtain, usually in a more pronounced manner, and in some places the scaliness is so marked that the follicular character of the disease is not readily recognizable. In other parts of the body, especially about the back of the neck and in the flexures, the follicular and papular characters are so pronounced that such areas roughly resemble mild ichthyosis hystrix. Taken as a whole, the disease roughly presents features of psoriasis, keratosis pilaris, and ichthyosis. Inflammatory signs are practically absent or mild in character. The nature of the disease is not understood.

The treatment is essentially that of psoriasis, although arsenic, if used, is to be prescribed with caution, as it may make matters worse. Exciting the sweat-secretion with pilocarpine and warm baths should be a part of the treatment.

POMPHOLYX (CHEIRO-POMPHOLYX).

THIS disease is rather uncommon. It is characterized by a vesicular or bullous inflammation limited to the hands and feet, and may be sudden or gradual in development. A good deal of œdema and swelling, with pain, burning, and sometimes itching, are also observed. The lesions are, at first at least, somewhat deep-seated. A condition of hyperidrosis of the parts is sometimes seen as preceding and accompanying the disease. The hyperæmic element is usually slight, the affected parts often having a sodden appearance. The disease is observed in those of a nervous temperament who are depressed in health. It tends to recur at irregular intervals. The immediate attack usually subsides after a few weeks. Treatment is essentially that of acute eczema. The constitutional treatment is with active tonics, such as arsenic, iron, and strychnine.

PRURITUS.

PRURITUS is sometimes met with in the course of certain organic and systemic diseases, sometimes as a symptom of a functional disorder, and sometimes apparently independently of any constitutional

factor. In all cases a careful investigation must be made into all the possible etiological factors, the kidneys, liver, and digestive tract especially receiving attention. The constitutional treatment will therefore be directed toward removing any condition which may seem to have a predisposing influence. In many of the cases the digestive tract will be found at fault. Salines and antacids, especially the sodium salicylate, have an important place in the treatment. In the apparently causeless cases constitutional treatment is entirely empirical. Atropine, potassium bromide, sulphonal, antipyrin, lithia salts, cannabis indica, gelsemium, pilocarpine, lupulin, ammonium valerianate, and similar drugs are variously prescribed, and often with relief.

External treatment is always necessary for immediate effect. The most valuable applications are: a lotion of carbolic acid, 1 to 3 drachms, alcohol 1 ounce, and water to make a pint; a lotion of liquor carbonis detergens, 1 to 4 teaspoonfuls to the teacupful of water up to the pure solution; liquor picis alkalinus, 1 to 4 drachms to the pint of water, used cautiously; one of benzoic acid, 2 to 4 drachms, the same quantity of glycerin, and a pint of water.

In some instances, especially in some cases of senile pruritus when the skin is harsh and dry, oily or ointment applications are more beneficial. Benzoic acid, 10 to 30 grains to the ounce of petrolatum and lanolin; menthol, 5 to 20 grains to the same ointment base, or in liquid petrolatum; an ointment of the same base with 10 to 30 grains each of camphor and chloral to the ounce; one of carbolic acid, 5 to 20 grains to the ounce, and similar remedies incorporated in salve form, will be found among the most satisfactory.

In the local forms of pruritus—pruritus scroti, pruritus ani, and pruritus vulvæ—the same applications will also be found useful. In addition to the above may be mentioned a solution of silver nitrate in spirits of nitrous ether, 5 to 10 grains to the ounce, painted carefully over the parts in pruritus scroti; the tincture of benzoin painted carefully over the parts in obstinate pruritus vulvæ; and cocaine and menthol lotions or ointments, 1 to 5 per cent. strength, in pruritus ani. In these local varieties sponging with hot water, as hot as can be borne, will often give temporary relief.

In pruritus hiemalis, that form of the disease which in some individuals makes its appearance as soon as cold, dry, and windy weather sets in, the above applications may be tried one after the other till relief is afforded; ointment applications are the more generally useful in this variety. In the pruritus immediately following a bath, which not a few persons suffer from, glycerin lotions, 1 or 2 teaspoonfuls to two tablespoonfuls of water, a mild ointment application such as petrolatum or cold cream, or a lotion of carbolic acid, will afford some relief.

PSORIASIS.

It can scarcely be said that any great progress has been made in the treatment of psoriasis in the past ten years. The various remedies, both external and internal, which have been employed have, it is true, been weighed in the school of experience, and the result is the status of to-day. The medical treatment should have the full co-operation of the patient as to proper regulation of the diet, out-door exercise, and the avoidance of stimulants.

As to diet it is difficult to state positively how much influence it has for good or bad, but it is known that foods which will lead to any disturbance of digestion or those which are of difficult digestion will have a varying unfavorable influence and tend to retard recovery. Over-eating and lack of compensating exercise will also influence the disease unfavorably. Occasionally patients are met with who will respond more rapidly to treatment when they have the aid of a largely vegetable diet; and on the contrary some cases will do well on just the opposite, almost a purely meat diet. Each case must be studied individually.

As to the constitutional medicinal treatment, that plan will be most frequently successful that takes a comprehensive view of both the patient himself and his skin-disease. Any existing irregularity in the general health must be looked after. The bowels are to be kept sufficiently free. In those cases in which debility is the predisposing factor—for instance, psoriasis occurring in women during the nursing period—suitable tonics are to be administered, especially the hypophosphites, cod-liver oil, and iron preparations. In those patients in whom there is a distinct gouty or rheumatic underlying cause, the alkalies, salicylates, salicin, colchicum, and other remedies of this class come into play. In short, not a few patients with a psoriatic tendency will remain practically, or in great measure, free from cutaneous eruption so long as a proper tone of the general health is maintained.

Irrespective of any recognized constitutional predisposing factors, certain remedies may be tried when a line of treatment based upon the above suggestions fails. The remedies of this class which have more or less of a recognized use to-day are arsenic, the alkalies, potassium iodide, tar, spirits of turpentine, wine of antimony, oil of copaiba, and thyroid gland. Of these arsenic stands first in value. It may, in fact, be said to exhibit a specific control of the disease in at least a fairly large proportion of the cases. Its value is shown most in the beginning attacks or in those cases, even if of long duration, in which the remedy has as yet not been systematically employed. In subsequent attacks its usefulness is not so well marked, and it frequently fails

absolutely. Its action is usually unfavorable in the markedly acute spreading disease. In other cases it may be given along with other lines of treatment. The dose should rarely exceed ten drops of Fowler's solution three times daily or the equivalent of arsenous acid or the solution of sodium arsenate. The beginning dose should be small, about 3 minims of Fowler's solution, and, if there is no improvement and no unfavorable symptoms from the arsenic itself, the dose may be gradually increased. The average dose is about 4 or 5 minims. The alkalies are, as already referred to, useful in the rheumatic and gouty cases, but independent of any such recognized factor or complication, they seem to be extremely useful in the actively inflammatory disease occurring in robust and plethoric individuals. It is also especially in this last class of cases that wine of antimony may be tried, giving 5 to 8 drops three times daily. Spirit of turpentine is given in 10- to 30-drop doses three times daily, in capsule or emulsion, preferably the latter. During its administration, and also with the administration of the oil of copaiba, large doses of water should be taken throughout the day, or some demulcent drink such as barley-water. Its action upon the kidneys and bladder must be carefully watched, especially if the largest doses are given. Tar may be administered in capsule or emulsion, the dose being 10 to 30 minims. Potassium iodide, if given in large doses, 20 to 60 or more grains thrice daily, will have a favorable influence in some cases, but its effects, especially in the largest doses, should be supervised. Thyroid extract, in 1- to 5- or even 10-grain doses may be tried in persistent obstinate cases, the remedy being discontinued or the dose diminished should any untoward symptom arise.

The external treatment is all-important in most cases. In individuals in whom the disease is sparse, or but slightly inflammatory, a daily warm bath of five to twenty minutes' duration, or a weak alkaline bath, will, along with suitable systemic treatment, often bring about a favorable result. Even in more extensive cases, more especially where the spots or patches are small, this same plan of external treatment, especially with the alkaline baths, will prove curative. If the skin should, as a result of the use of the alkaline baths, become somewhat harsh and dry, some simple ointment may be rubbed in after each bath. Equal parts of petrolatum, cold cream, and lanolin, with 10 grains of salicylic acid to the ounce, is a good formula. The bath is, of course, to be employed in all cases of the disease not only for the slight or great influence in itself which may be exerted, but also for the reason that it is essential in keeping the patches free from scales; this latter condition is necessary for the proper and efficacious application of the active remedies to be referred to. In markedly acute cases or in cases of a markedly inflammatory type, bran or

starch baths may be demanded at first till the acuteness of the symptoms has subsided. Cases are unusual, however, in which mild alkaline baths cannot be employed from the first. In some cases the sulphur bath, made with potassium sulphuret, 2 to 6 ounces to the bath (about thirty gallons) is beneficial, followed by a mild or strong salve according to circumstances.

When the disease exists in large patches or diffused areas, the more active or special external remedies are to be used. The most generally employed at present are tar, chrysarobin, pyrogallic acid, naphthol, white precipitate, aristol, resorcin, gallacetophenone. Tar is one of the oldest applications employed in this disease, and therapeutically speaking it is for the general run of cases the most satisfactory and effective. Its odor bars it out, however, from the general use it otherwise deserves. The pure tar ointment, at first weakened with lard or petrolatum, the oil of cade, and the oil of birch, 1 to 3 drachms to the ounce of simple cerate or prepared suet, or with olive oil or alcohol, or pure, are the preparations most in use. The ordinary tar ointment is the most objectionable. Another preparation of tar is that known as liquor carbonis detergens. This last is a solution of coal-tar in the tincture of soap-bark. It is not so efficient as common tar, but it is much more elegant and its odor is less persistent. It may be used pure or weakened with water, and rubbed into the patches, or it may be incorporated with simple cerate or suet, 2 or 3 drachms to the ounce; or it may be prescribed with an equal part of liquor calcis sulphuratæ and used as such in full strength or weakened with water. Chrysarobin may be applied as an ointment, 30 to 60 grains to the ounce, or as a paint with collodion or gutta-percha solution. In these latter it is common to add 10 to 30 grains of salicylic acid to the ounce. If the collodion is used as the vehicle, 5 minims of castor oil may also be added to the ounce to make the film somewhat more flexible. Pyrogallic acid may be used similarly to chrysarobin and in the same strength; it should not, however, be applied too extensively at one time, for fear of absorption and toxic action. Both of these drugs are active but have some disadvantages. Both stain, chrysarobin very positively, pyrogallic acid slightly; and both, if used carelessly, may provoke a mild or severe dermatitis of the surrounding skin, more especially the chrysarobin. If carefully used, however, this latter disadvantage may be guarded against, and if signs of cutaneous irritation show themselves may be temporarily suspended. The salve is the most energetic, but thus used the disadvantages mentioned are more apt to present themselves. If the paint is employed, an application is made about every three or four days. At the end of this time the film has either fallen off in part or in entirety, or may be readily washed or picked off, and a new

application may be made. Gallacetophenone, aristol, and resorcin are used in the form of ointments, about 40 to 60 grains to the ounce. White precipitate is also employed in the same strength, and as it is a white preparation it is more particularly employed for the disease upon the scalp. Naphthol, about 1 drachm to the ounce, is a reserve remedy of about the same efficacy as the remedies last mentioned, and is employed as an ointment, 30 to 60 grains to the ounce. An ointment, if employed should be energetically rubbed into the patches, and the excess wiped off and the parts sprinkled with a dusting-powder. If a liquid application is made, such as the liquor carbonis detergens or its admixture with liquor calcis sulphuratæ, it should be rubbed in well; if after a few days the skin should seem harsh, a mild salve is to be used in conjunction with it.

PURPURA.

An opinion as to the outcome or even duration of an attack of purpura cannot be stated with certainty. The milder types (purpura simplex) give rise to no discomfort as a rule, and sooner or later pass away with or without treatment. Occasionally this form persists more or less continuously for months or for several years. Exceptionally it may pass into the hæmorrhagic type, and may then be of possible serious import. In the more severe types (purpura rheumatica, peliosis rheumatica) the symptoms are somewhat more urgent, often including rheumatic pain and swelling of the joints, together with mild or severe febrile disturbance. These cases, also, usually get entirely well in the course of a few weeks or months, but as in the mildest examples of the disease this type may also exceptionally pass into the more grave hæmorrhagic form (purpura hæmorrhagica, "land-scurvy," morbus maculosus Werlhoffii). This grave type is not very common, and the cutaneous hæmorrhages partake more of the nature of ecchymoses and extravasations. There may occur also bleeding from one or several of the mucous surfaces, so that the patient's condition soon develops into one of profound anæmia. In rare instances the hæmorrhages from the mucous surfaces, the mouth, nose, bowels, or lungs, may be so profuse as to lead to rapid collapse and even death.

The treatment of the various forms of purpura vary somewhat according to the type. The remedies usually prescribed are oil of turpentine, oil of erigeron canadensis, ergot, dilute sulphuric acid, tincture of ferric chloride, strychnine, silver nitrate, and gallic acid. If, as in most of the mild examples of the disease, there is no appar-

ent etiologic factor, the remedies to prescribe are ergot, gallic acid, and turpenture. If the disease seems dependent upon, or is associated with, an anæmic or chlorotic condition, then iron, quinine, and strychnine are usually given, commonly in conjunction with one of the purely astringent remedies first named. In the grave cases ergotin, gallic acid, and turpentine are depended upon for controlling the hæmorrhage; other treatment indicated by the general condition of the patient is likewise instituted. In purpura rheumatica and purpura hæmorrhagica perfect rest in the recumbent position should be enjoined as long as the symptoms are urgent. For some time after the disease disappears the state of the patient's health should be looked after, and all possible measures taken to place him in as good general condition as possible; by so doing the possibility of relapses, which are not at all uncommon, may be prevented.

As a rule external applications are not called for in purpura; astringent applications to bleeding mucous surfaces will aid in checking hæmorrhage from these parts.

SCORBUTUS (SCURVY; SEA-SCURVY; PURPURA SCORBUTICA).

This disease often comes under the care of the dermatologist owing to the cutaneous symptoms. The prognosis is favorable, the disease being remediable and usually rapidly so. This is true in cases in which the predisposing causes are no longer acting. When, however, the same bad hygienic conditions, unfavorable circumstances, and ingestion of scanty and unsuitable food are continued, the patient's health becomes gradually worse and worse, and death finally ensues. Successful results, therefore, usually require, first of all, proper hygiene in the wide sense of that term, and proper food, with an abundance of fruit and vegetables. Lemon-juice and lime-juice, for both curative and preventive purposes, have always proved of great value; they should be taken freely. The general condition of the patient must be cared for, and tonics and stimulants prescribed when deemed necessary. The essential treatment, however, lies in the proper food-supply. Unless ulceration is present the cutaneous manifestations, as a rule, require no special attention. If there is ulceration, the ordinary mild and antiseptic astringent ointments and lotions used in eczema may be employed. For the tumid and spongy gums, astringent mouth-washes of myrrh and potassium chlorate may be used.

SEBORRHŒA.

THERE is a strong tendency to crowd seborrhœa out of the dermatological list, and place the cases heretofore belonging under that head in the domain of Unna's "eczema seborrhoicum." Inasmuch as this writer holds that the oil is excreted by the sweat-glands, the heretofore so-called "seborrhœa oleosa" he would term "hyperidrosis oleosa." For our present purpose it is just as well to consider under the present heading all those cases of scaly and slightly crusted condition found upon the scalp and about the region of the nose, unaccompanied with any visible signs of inflammation.

Successful treatment requires a careful supervision of the patient's general health, and the importance of this part of the management is not lessened by the fact that present opinion seems to be inclining toward considering the disease as possibly parasitic and contagious. The disease is seen most frequently in those of sedentary habits, in the anæmic and debilitated, and in those of weak digestion. It is true that in a not inconsiderable number of the cases there seems to be nothing at fault with the general health. In such cases constitutional medication is not called for. The line of systemic treatment depends upon a study of each case. Laxative, digestives, iron and arsenic preparations, and cod-liver oil, are therefore prescribed most frequently. There are no specifics.

As to external treatment it is essential that the scalp or part affected be kept free from scaliness or crusts. This is done by an occasional shampoo in mild cases and a daily washing in the markedly crusted or scaly cases. After the case is under way, the frequency of the shampoo will depend upon the rapidity of the re-accumulation of scales or crusts, and also the amount of soiling brought about with the remedies employed. For average cases the shampoo may be made with the ordinary toilet soap or a boric acid soap; in cases in which the crusting is marked and adherent, the tincture of sapo viridis may be used. In a few of these severe cases one or two preliminary soakings in carbolized oil may be necessary before the crusts yield to the shampoo.

The important remedies for external application are sulphur, resorcin, salicylic acid, salol, aristol, and white precipitate or calomel. Sulphur is employed as an ointment, 30 to 60 grains to the ounce of petrolatum or lanolin and petrolatum; salicylic acid is frequently added to this ointment, or may be prescribed alone, 10 to 20 grains to the ounce; salol, in ointment, 20 to 40 grains to the ounce; white precipitate and calomel, in the same manner and in the strength of 20 to 60 grains to the ounce. Resorcin, next to sulphur and the mercurials in value, may be prescribed in aqueous or alcoholic solu-

tion, and is extremely useful, especially in the milder cases, and in the severe cases in the later stages of the treatment. The following formulæ are usually prescribed :

℞.	Resorcin,	gr. xl–lxxx (2.6–5.3) ;
	Glycerin,	♏x–xx (0.65–1.2) ;
	Alcoholis,	ʒss (15.0) ;
	Aquæ dest.,	q. s. ad fʒiv (120.0).—M.

℞.	Resorcin,	gr. xl–lxxx (2.6–5.3) ;
	Ol. ricini,	♏x–xx (0.65–1.2) ;
	Alcoholis,	fʒiv (120.0).—M.

A valuable addition to the alcoholic lotion, especially when there is a disposition to alopecia, is the alkaloid quinine, 3 to 5 grains to the ounce. Resorcin is also used in ointment form, 10 to 40 grains to the ounce. The applications are to be made, as a rule, once daily ; later at less frequent intervals, every two days, and gradually lessening the frequency to once or twice weekly. In those especially predisposed to the disease and in whom recurrences are common it is advisable to continue the remedial applications once or twice weekly, and to shampoo the head once every ten days or so with a medicated soap of sulphur-naphthol or resorcin. For the oily form of the disease upon the scalp, the alcoholic lotion of resorcin or of resorcin and quinine is especially valuable.

For seborrhœa of the nose and its immediate neighborhood, of the slightly scaly or crusted type, the same plan of treatment as employed for the disease upon the scalp is to be commended, except that the remedies should not be used in more than one-third the strength. An ointment of acetanilide, 5 to 30 grains to the ounce, is also useful here. For the oily seborrhœa of the nose the same remedies and combinations employed in acne and acne rosacea, at first reduced somewhat in strength, are to be advised. Oily seborrhœa is in fact often associated with the milder types of acne rosacea.

TINEA TRICHOPHYTINA (RINGWORM).

Ringworm varies somewhat in the plan of treatment adopted according to the region affected. As the disease occurs upon non-hairy portions of the body, much milder applications are usually sufficient than are employed when the disease is upon the scalp. Upon the bearded region moderately strong remedies are required.

Upon the crural region mild applications may suffice, but frequently the stronger remedies become necessary. Upon non-hairy parts the most frequently used applications are: An ointment of sulphur, 1 or 2 drachms to the ounce; white precipitate or calomel ointment, 20 to 60 grains to the ounce; a solution of sodium hyposulphite, 1 drachm to the ounce; corrosive sublimate lotion, $\frac{1}{2}$ to 2 grains to the ounce; carbolic acid lotion or ointment, 5 to 30 grains to the ounce; painting with tincture of iodine, pure or diluted with alcohol; or any of the various other remedies to be mentioned in connection with the treatment of ringworm of the scalp, except that these should be employed in one-third to one-half the strength there noted.

Upon the bearded region the same class of remedies is employed, and of about the same strength as above mentioned—made stronger in obstinate cases. Two good plans of treatment for the disease in this region consist of the conjoint use of a corrosive sublimate lotion and the application of one of the mercurial ointments above noted, or an ointment of oleate of mercury, 5 to 20 per cent. strength; the other plan consists of the conjoint use of the lotion of the sodium hyposulphite with the sulphur ointment. The lotion is applied, somewhat weakened, to the whole bearded region in order to prevent the infection of new areas, and to the diseased areas themselves it is applied in the above-prescribed strength, and, after drying, the ointment is well rubbed in. These applications should be made at least twice daily. The parts should be washed with soap and water once daily. Along with the medical treatment, extraction of the hairs from the diseased patches is advisable, as this procedure shortens the period of treatment considerably.

In the crural region, the two plans just referred to will also prove valuable, and often curative. In addition to these two plans, the other remedies already referred to may also be tried. In those cases where there is considerable eczematous irritation, a lotion of boric acid, 15 grains to the ounce, with 5 to 10 grains each of resorcin and carbolic acid to the ounce, will serve to allay the more active symptoms. The addition of an insoluble powder to this lotion, such as 10 to 20 grains of calamine and zinc oxide, will prove of distinct advantage in some cases. Painting the parts with tincture of benzoin or myrrh containing 1 to 4 grains of corrosive sublimate to the ounce may be adopted in obstinate cases. In others the parts may be vigorously and somewhat harshly shampooed with sapo viridis for three to ten minutes, then rinsed off and a mild ointment such as advised in eczema applied.

Ringworm of the scalp when once thoroughly established and of some duration is the bane of dermatological practice. Many cases, especially in the earlier weeks of the disease, will respond to almost

any plan, but other cases prove most intractable, months of persevering treatment being necessary to bring about a cure. If the disease is seen in the first few weeks and is limited to one or two patches, a good plan of treatment is to paint on daily the tincture of iodine containing 1 or 2 grains of the red iodide of mercury to the ounce. After several days a variable amount of irritation is produced, and it is then temporarily suspended, during which time any of the mild salves already mentioned may be used. In fact, in such cases any of the ointments alone will often prove sufficient to cure the disease. In the more obstinate cases, or those of longer duration, or those which have had many of the ordinary remedies applied without result, recourse must be had to stronger applications. Of these the most valuable are corrosive sublimate, in the form of a lotion, 1 to 4 grains to the ounce; pyrogallic acid, 10 to 40 grains to the ounce of ointment; naphthol ointment, 1 drachm to the ounce; and chrysarobin, 20 to 60 grains to the ounce. This last remedy may also be used in the form of paint with collodion or liquor gutta-perchæ, 30 to 60 grains to the ounce. Strong corrosive sublimate lotions should not be employed if the area of disease is very large; it is to be thoroughly dabbed on twice daily. If one of the ointments is selected it should be well rubbed in for several minutes.

Chrysarobin is the most active remedy in our possession, but has the disadvantage of often exciting dermatic inflammation of the surrounding skin as well as disagreeable staining properties. If carelessly used, some of it may be carried to the eye and provoke a conjunctivitis. Its use as a paint is less apt to be attended with those disadvantages than in a salve form, although this latter is probably more effective. The paint is applied twice daily for several days, at least till quite a thick coating is formed or signs of active irritation present themselves. It is then discontinued and a mild salve employed till the crust formed comes off or can be readily picked off. If there is much underlying irritation, the salve is continued for a day or two and the painting then resumed. If chrysarobin is employed as an ointment, it is, like the other salves, to be well rubbed in twice daily, and continued till irritation results, then temporarily set aside and a mild ointment employed. If after a time no improvement is noticed, or if after a time improvement ceases, a new plan of treatment is to be adopted. At the end of three or four weeks it is well to intermit treatment, applying a mild lotion or salve for several days, and then take a survey of the condition.

There remains a method which may be adopted in the extremely rebellious cases, in which the patches are few and distinct: the method of producing an active artificial sero-purulent inflammation with croton oil is referred to. It is a procedure not entirely devoid of danger,

and one which may, especially if carelessly used, be followed with permanent hair loss, and therefore it should not be employed except in suitable and urgent cases. But one area, and that not over an inch in diameter, is to be tried at a time. The oil, at first with two parts of olive oil, is carefully painted on with a fine brush, using a minute quantity. This is repeated twice daily. After two or three days acute inflammation should be excited. If this has not resulted a stronger application must be made use of. After the inflammatory action is aroused, a mild ointment, containing $\frac{1}{2}$ drachm or 1 drachm of boric acid or 10 or 20 grains of sulphur to the ounce, is to be used. As soon as this inflammation has subsided, another patch may be attacked. Occasionally a second application to the same area is necessary. Lactic acid, at first diluted with one or two parts of water, may take the place of croton oil, but it is not so surely effective.

There are certain other procedures in the management of ringworm of the scalp which remain to be mentioned. If the diseased area is large and irregularly distributed it is advisable to have the hair closely cropped over the entire scalp; if there are but a few well-defined patches, then it should be cut very close on and around the patches and be allowed to remain about one-half to three-quarters of an inch long over the remaining portions. This facilitates treatment, and permits the early discovery of any other points of infection. In addition to the application of the stronger remedies to the diseased areas themselves, a general application should be made to the entire scalp to prevent the disease spreading. For this purpose a weak corrosive sublimate lotion, $\frac{1}{2}$ to 1 grain to the ounce, may be used, or a lotion of carbolic acid, 2 to 3 drachms to the pint, or a saturated boric acid solution containing carbolic acid and 2 or 3 drachms of resorcin to the pint. The general application of sodium hyposulphite solution, 1 drachm to the ounce, applied freely, following the next morning with dilute acetic acid or vinegar, giving rise to nascent sulphuric acid, is usually efficient as a preventive and in mild cases curative. Or an ointment of sulphur, 1 drachm to the ounce, may be employed for this purpose.

Another procedure which is of great value is the extraction of the hairs from the diseased patch, as this materially shortens the time of treatment. This cannot be readily done if a large part of the scalp is involved.

As to soap-washing, it is advisable to employ a medicated soap such as a sulphur-naphthol soap. The entire scalp should be washed about every two days, and the lather allowed to remain on for five or ten minutes before rinsing off; immediately afterward the general preventive applications should be made, and also the stronger remedial application to the individual patches or areas.

While ringworm is parasitic and considered entirely local, it is advisable that the patient's general health be looked after. Plain, nutritious food, and tonics such as iron, cod-liver oil, and the hypophosphites are frequently prescribed with apparent advantage.

TINEA VERSICOLOR (CHROMOPHYTOSIS).

THE most satisfactory remedies in the treatment of this disease are sodium hyposulphite, a sulphurated sapo viridis, corrosive sublimate solutions, and naphthol ointments. This list could be materially increased; in fact, any of the remedies suggested for the treatment of ringworm will prove efficacious in this disease. Sodium hyposulphite is applied in the form of a lotion, 1 drachm to the ounce; corrosive sublimate as a lotion, 1 to 3 or 4 grains to the ounce; naphthol as an ointment, $\frac{1}{2}$ to 2 drachms to the ounce. The parts affected should be thoroughly treated with the selected remedy; if a lotion dabbing it well on, and if an ointment rubbing it well in. The parts should be washed once daily; in mild cases with ordinary toilet soap, and in more extensive and obstinate cases with sapo viridis.

The best method of treatment in the average case is the conjoint use of the sodium hyposulphite lotion, and the daily washing with the sulphurated sapo viridis. This latter is variously made of from 1 to 3 drachms of precipitated sulphur to the ounce of sapo viridis.

In extremely rebellious cases the parts may be thoroughly shampooed with this soap, the lather allowed to remain on; this process is repeated once daily till a moderate degree of irritation results, when the accumulated soapy applications are rinsed off. If there should result any marked irritation or an unpleasant tightness of the skin a mild salve is to follow.

URTICARIA.

ACUTE urticaria is usually caused by acute indigestion or the eating of some food that disagrees, or which in the individual, from some idiosyncrasy, acts as a poison. The accepted treatment consists substantially in the administration of a laxative, preferably a saline, and an antacid, such as sodium salicylate, 5 grains three or four times daily, or sodium bicarbonate: this latter especially in children. Many cases of the acute disease will respond at once to a nightly dose of the ordinary calcined magnesia, repeated two or three nights if necessary.

This remedy combines both laxative and antacid properties and is extremely valuable. In urgent acute attacks when the disease involves the epiglottis and throat, with symptoms of an alarming character, an emetic may be administered to get rid of the offending substance in the stomach; the subsequent treatment consisting of a saline and antacids or two or three doses of calcined magnesia.

The most common causes of chronic urticaria are digestive or assimilative irregularities, neurasthenic conditions, and in women functional or organic disease of the utero-ovarian system. In many cases, it is true, the cause is difficult to recognize. Depending upon the etiological factor systemic treatment will vary. Probably, in the majority of cases, antacids with remedies to tone up the digestion, with an occasional saline, will be most fruitful of results. Independently of any assignable cause empirical remedies may be resorted to. Of these the most valuable are belladonna or its alkaloid atropine, sodium salicylate, pilocarpine, ergot, potassium bromide, antipyrin, phenacetin, gelsemium, strychnine, and minute doses of nitro-glycerin. In obstinate cases a rigid milk diet, with relaxation from care and work, will bring about a curative result. In especially obstinate cases a change of air and climate may be advised.

As to the external treatment, ordinarily some domestic application, such as vinegar, a tablespoonful of vinegar to a teacupful of water, and dilute alcoholic lotions, will be sufficient to relieve the irritation pending the action of systemic remedies. In the chronic cases, however, the more active anti-pruritic remedial applications will be required. Of these the best are carbolic acid, 1 to 3 drachms to the pint of water, to which one or two ounces of alcohol may be added with advantage; liquor carbonis detergens diluted with several or more parts of water and gradually strengthened even up to the pure solution; a saturated solution of boric acid, with or without carbolic acid; mild alkaline lotions, 1 to 3 or 4 grains of sodium carbonate to the ounce of water. In extensive cases tepid bran-baths or mild alkaline baths will often give temporary relief. In persistent cases where the relief from these several applications is unsatisfactory, the various other applications referred to in the treatment of pruritus may be prescribed. In those exceptional cases of urticaria in which some of the lesions become bullous, the larger bullæ should be punctured and emptied, and some mild salve such as the oxide-of-zinc ointment applied spread upon lint. Or the lotion may be employed first, allowed to dry, and then the ointment applied.

XERODERMA PIGMENTOSUM.

THIS disease, also called "parchment skin," and "angioma pigmentosum et atrophicum," is rare. It has been noted to occur in several children of the same family. It appears in the first few years of life. Its most prominent symptoms are numerous disseminated freckle-like pigment-spots, telangiectases, more or less shrinking and contraction of the skin, atrophied muscles, and sometimes minute warts or wart-like lesions—later in its course epitheliomatous growths and ulceration appear. Its course is slow, usually extending over years. Death finally results. There is apparently a congenital predisposition. The disease is probably a degenerative atrophy.

Treatment is palliative, and based upon general principles.

SPASMODIC AFFECTIONS OF THE NERVOUS SYSTEM.

By JOSEPH COLLINS, M. D.

CONVULSIONS OF CHILDREN (ECLAMPSIA INFANTUM).

The name "eclampsia" should, I believe, be reserved to indicate those convulsive attacks which occur during the first two years of life and which are not dependent upon organic disease of the nervous system, but arise from irritation of various parts of the body.

Convulsions the result of slight causes are much more apt to occur in young children than in adults. They are symptomatic manifestations, and the first thing to be done for their treatment is to search for their source and causation.

This search will be greatly facilitated if it be kept in mind that convulsions are an expression of irritation of the motor areas of the cortex or of the convulsive centres in the brain-ganglia, pons, and oblongata, which irritation may be direct and mechanical as from a clot or spicula of bone, or direct and chemical as from the circulation of peccant matter in the blood, or indirectly by the transmission of sensory irritation from some adjacent or distant part of the body, as from the mouth, or gastro-intestinal organs. Convulsions of children might also be considered as of organic or functional origin, but the classification I have mentioned has the advantage that it indicates, in a measure, the way in which they are caused.

After the origin or source of convulsions in infants has been determined there are two things incumbent: one, the removal of the cause so far as possible, the other, the treatment of the attack itself.

Treatment of the Causes.

In some instances it will be possible to remove the cause, for instance when the attack is due to indigestible substances in the stomach and bowels, to cholera infantum, dysentery, constipation, swollen gums associated with the eruption of the teeth, organic poisons in the blood and the urine, such as urea, glucose, etc., but in other instances in which the cause is of an organic nature and the convulsions

are the expression of some mechanical and irritative condition, such as meningeal hæmorrhage, products of inflammation, and new growths in the tissues of the central nervous system, removal of the cause will be impossible, although some measures may be taken for its alleviation.

Of the convulsions of children we are concerned chiefly in the treatment of those that have no organic or focal basis in the central nervous system. I shall therefore make no further mention of the cases that occur with diseases of the meninges and brain, or those that occur as the first symptoms of idiopathic or hereditary epilepsy, and shall consider only those that are sometimes referred to as of reflex origin—meaning by that designation a central manifestation of peripheral irritation.

Convulsions are powerfully predisposed to by hydræmic and other impoverished conditions of the blood, such as occur with rachitis, after acute infectious diseases, etc., and they may occur without any other cause than loss of blood. When any of these conditions can be made out in children with convulsions they should receive particular treatment; in grave cases possibly transfusion of normal saline solution should be performed.

The condition of the buccal cavity and the gastro-intestinal canal should be investigated with great care in every case of eclampsia infantum. Swollen, inflamed gums should not be treated by cutting them, or by giving the patient something to bite on; such measures add to peripheral irritation, which is already excessive to a pathological degree. They should be treated by antiphlogistic applications such as cold to the outside of the face and diluted solution of aconite and iodine locally. If there is reason to suspect the presence of indigestible substance in the stomach a brisk emetic, such as ipecacuanha, should be administered, and then a cathartic. If constipation exists, a clyster should be given. A suspicion of intestinal worms justifies the administration of any of the well-known anthelmintics such as santonin, and saline cathartics, after which the stools should be scrutinized for small worms and sections of tape-worm, and, if these are found, remedies adapted to their expulsion given. Careful examination of the urine and of the blood are of the greatest service, and any deviations from normal which such examinations reveal should be rigorously combated.

When convulsions are apparently excited by hyperthermia, the most beneficent results follow putting the patient in a bath of from 90° to 80° F. and letting him remain there from fifteen to thirty minutes. If this is not feasible the same object can be attained by cold-water ablutions or the application, for a short time, of the cold pack; an ice-bag being placed on the head.

If an adherent prepuce or any other discoverable source of peripheral irritation can be found, it should be corrected as soon as possible.

Convulsions occur very frequently in rachitic children, and when there are evidences of this depraved condition active measures, dietetic and medicinal, should be taken for its cure. Phosphorus, cod-liver oil, arsenic, quinine, etc. may be given for their constitutional effect, and at the same time small doses of valerian or the bromides for their transient symptomatic effect.

A local form of convulsion—laryngismus stridulus, or cerebral croup as it is sometimes called—which occurs almost exclusively in children who are so profoundly rachitic as to present craniotabes, requires particular mention. It comes on with such abruptness and the symptoms soon become so alarming that oftentimes it is necessary to use heroic measures, such as tracheotomy, to spare the child's life. In the ordinary case the treatment required is to lift the child from the bed, throw the head back so that air can enter the respiratory passages with facility as soon as the spasm relaxes, pull the tongue forward, throw cold water against the body, or subject the skin to smart flagellation in order to stimulate the inspiratory centre to take the prolonged inspiration which it always does accompanied with the whoop when the spasm relaxes. If it is possible to make the patient inhale at all, a few drops of chloroform or of nitrite of amyl will quickly terminate the spasm, and whenever they are at hand and can be utilized, this is the treatment to follow. In some instances wrapping a compress wrung out of hot water around the throat and then throwing cold water against the surface of the body is quickly efficacious.

If the spasm is persistent and the child's life is despaired of, there should be no hesitation in opening the trachea to admit the ingress of air, but in cases where the ordinary measures do not suffice to relieve the spasm promptly, it is advisable to give a small dose of morphine hypodermically. This is usually soon followed by a relaxation of the spasm.

Attacks of laryngismus stridulus usually terminate before the physician has time to reach the patient. His duty then is to prevent a recurrence of the symptom. This can be done by the administration of bromides, valerian, asafœtida, etc. for their symptomatic effect, and afterward making use of every possible measure to combat the depravity of nutrition which allows the symptom to occur.

Treatment of the Attack.

When a physician is called to a child in convulsions the urgency of the symptoms, both on account of the parents' comfort and the patient's welfare, does not permit of searching for the cause. On

account of the mortality of eclampsia infantum (10 per cent.) it is necessary to check the severity of the spasm at once. For this purpose, not the slightest hesitancy should be had in using inhalations of chloroform or nitrite of amyl, or a mixture of equal parts of these substances, until the tonic or tonico-clonic spasm (which these convulsions frequently are) begins to subside. After this, search may be made for the cause, and, if it be easily determined, measures specifically directed to its alleviation should be taken. At the slightest evidence of recurrence of spasms the inhalations should be repeated. It is rarely ever necessary to carry the patient into even a slight state of narcosis; a much lesser degree than that produced during parturition is generally sufficient. Domestic measures such as immersing the patient in warm or hot water, mustard baths to the feet, etc., are of very little use, and the time consumed in their application is wasted and ought to be employed in the way that I have indicated. Putting the child in a moist warm pack, with ice to the head, after the first convulsion, will very often prevent a second attack, and so will immersion for a long time in a lukewarm bath.

After the severity of the convulsion has been coped with, or after the attack has ceased at least temporarily, bromide of potassium or sodium in doses to suit the age of the child should be given, and kept up for a few days, while the child is kept absolutely quiet in bed and is placed on the simplest and most easily digested food. If the child is of such an age that it is still nursing, there is of course no reason to change this, except that it should be supplied in small quantities.

Drugs that have repute as anti-spasmodics or anti-convulsives, such as valerian, asafœtida, belladonna, etc., may be given, but, as a matter of fact, if anything else is necessary—a rare event—the most potent of all anti-convulsives, opium, can be used.

When the convulsion is an accompaniment of scarlet fever, measles, pertussis, malaria, etc., as it is sometimes, the measures that have already been mentioned for combating the attack should be made use of, and afterward an attempt should be made to mitigate the severity of the disease. In such cases it is generally the high temperature that is provocative of the convulsion, and it should be borne in mind that hyperthermia, it matters not with what disease it occurs, is most safely and quickly combated by the use of cold water.

TETANY.

TETANY is a toxic neurosis characterized by the occurrence of intermittent, recurring tonic spasm in the muscles of the hand, and sometimes in other parts of the body such as the foot, which causes it

to assume a position similar to that of the accoucheur when he makes a uterine examination; increased mechanical irritability of the motor nerves (Chvostek's symptom); increased electrical irritability of the motor nerves (Erb's symptom); increased mechanical and electrical irritability of the sensory nerves (Hoffman's symptom); and by the occurrence of the cramp condition when deep pressure is made, as by the finger on the extremity wherein the spasm has been manifest (Trousseau's symptom).

Tetany is due to, or follows, many very different infections and intoxications. As the treatment of the disease depends very largely on the etiology it is necessary to make brief mention of the causes. It may be caused by the activity of peptotoxins, intestinal toxins, the toxins that accumulate in the system after ablation of goitre, and by poisons generated during the course of any of the acute infectious fevers. It is sometimes caused by ingestion of one of the vegetable or mineral poisons, such as ergot, alcohol, chloroform, lead, phosphorus, etc. It occurs with conditions of bodily depravity such as are induced by pregnancy, with such disorders of nutrition as rachitis, and sometimes the only attributable causes are hygienic and dietetic errors. In all probability the seat of the lesion or the manifestations of the peccant activities of the poisons is the central nervous system, with sometimes a predilection for the brain, sometimes for other parts.

Treatment.

The treatment of tetany is first to discover the cause, render it non-operative, and if possible to get rid of it. This is not always an easy thing to do. For instance, cases of tetany which develop with stomachic dilatation are almost always associated with chronic ulceration near the pylorus, which requires assiduous and long-continued treatment before the disease begins to subside; but this is the most fatal form of tetany—from one-half to two-thirds of the victims succumb—while the ordinary forms of tetany not infrequently go on to recovery even if no treatment is instituted. After the causes of the disease are combated and removed, measures should be taken to prevent further impoverishment of the blood and to restore it as soon as possible to a normal condition.

When the disease occurs epidemically, the victims should be isolated, not on account of nervum contagiosum, but because the evil effects of imitation on a well child may be considerable.

The treatment of the cramp condition itself may summed up in few words: The physician's efforts should be to allay pain and to arrest muscular contraction. The medicines that have been found most useful for these purposes are a combination of chloral and belladonna or chloral and bromide. In very severe cases the administration of

hyoscyamine and curara by means of hypodermic injection may be necessary. As a rule, the first-mentioned measures, if associated with prolonged lukewarm baths for their sedative effects upon the peripheral sensory nervous system, revulsive and stimulating applications over the spine, and light rubbing of the extremity with sedative liniments will be quite sufficient.

The use of quinine, opiates, valerian, anti-rheumatics, etc. should never be indulged except to meet special indications, and then they are to be employed only as symptom-medicines. The same may be said of the administration of the bromides: they should never be given except for a few doses, as their action upon the blood is one that should not be courted in a disease that is in part the effect of blood-depravity.

The galvanic current can often be used with great efficaciousness: the cathode on the back of the neck or chest, and the anode on the nerve-trunk which supplies the parts which are the seat of the spasm, and a current of considerable intensity allowed to flow for several minutes. This procedure may be repeated twice or three times a day. It does not need mention that the faradic current is to be avoided, as it would aggravate the symptoms exceedingly. The liability to the occurrence of this disease should always be borne in mind when operations on the thyroid are advised, and whenever possible the surgeon should be counselled to do a resection rather than an extirpation. When the symptom occurs after operation on the thyroid, transplantation of thyroid as well as thyroid-feeding may have to be employed.

When the disease occurs in pregnancy, measures taken to combat the hydræmia may be sufficient to cope with it, but occasionally the severity of the symptoms becomes so great and their occurrence so frequent that measures taken to terminate the pregnancy must be considered.

There should be no hesitation in insisting upon weaning the child at once when tetany occurs in nursing mothers, not alone for the sake of the mother, but for the welfare of the child.

When the disease occurs in young children and no cause for its appearance is to be determined, it is well to bear in mind that the symptom-complex sometimes follows the hydræmia produced by intestinal worms, and that a few sharp doses of some anthelmintic will start these patients toward recovery.

In very rare instances the tonic spasms are so severe and so widespread that symptoms of asphyxia appear, and, if such a state should occur, inhalations of chloroform to relax the spasm must be given.

The convalescence of patients who have had tetany is often tedious and calls for the most assiduous dietetic and hygienic supervision.

Infantile tetany is a dangerous and often fatal disease. It occurs

in an active and a latent form and always calls for prompt treatment. The digestive tract should be carefully examined and undigested substances in the stomach removed by lavage, followed by a brisk cathartic. The usual measures for the treatment of tetany may then be given.

CHOREA.

THE term chorea means literally a dance; it is commonly and properly applied to the disease which has so long been known as St. Vitus' dance. It is a term, however, which has been greatly abused by some writers, who apply it to a number of affections—particularly the tics, of which irregular dance movements are a striking feature. The term chorea, without modification, should be limited to designate a humoral affection which occurs almost exclusively in an acute form—usually before puberty for the first time; a self-limiting disease which runs a rather typical course, characterized by involuntary, uncontrollable, abrupt, bizarre, dancing movements of the extremities, of the face, and sometimes of the trunk; motor unrest; amyosthenia, and mental sluggishness.

Eponymic nomenclature in the medical sciences should always be frowned at and discouraged, for it usually indicates ignorance or selfishness. Sometimes, however, such nomenclature fulfils a definite purpose and becomes a help: it is so in chorea; and to refer to Sydenham's chorea, Dubini's chorea, Bergeron's chorea, and Huntingdon's chorea is to refer to four distinct and separable diseases, all of which have in common dancing movements to which the term chorea is properly applied. The first, however, is a humoral disease and occurs when certain conditions of dissociation take place in the blood; the second is an infectious disease; the third is probably the outward manifestation of a general neurosis; and the fourth is a purely degenerative disease of the central nervous system, and has absolutely nothing in common with ordinary chorea except that both have involuntary, bizarre, dancing movements. Each of these forms will be referred to separately in speaking of the treatment, while the conditions variously denominated hammering chorea, laryngeal chorea, diaphragmatic chorea, chorea festinans, chorea procursiva, saltatory chorea, gesticulatory chorea, and so on to a most discouraging number, will be considered where they belong—under the Tics. Sydenham's chorea probably always occurs as the indirect result of certain dissociated conditions of the components of the blood. These are often directly conditioned by rheumatism, pregnancy, exhausting diseases and habits. Directly, the symptom-complex is often prompted into

being by psychical trauma, such as fright, acute worry, highly wrought anticipation, and reflexly from gastro-intestinal irritation such as that excited by the presence of worms, and very rarely from strain of highly endowed special sense-organs such as the eyes.

The significance of the occurrence of an attack of chorea is more than mere tenure of the symptom-complex indicates. In the first place the disease occurs more frequently in those whose heritage is neuropathic, in those whose rearing has been contributory to defective inhibition of passions and appetites, and in those who are unamenable to disciplinary measures of the nursery. An attack of chorea, be it ever so slight, in a way points to the existence of a neurotic diathesis and indicates that the possessor is more honestly entitled to succumb to the harassments of life than are his more stable fellows. A knowledge of this should make the treatment more far-reaching than through the weeks during which dancing movements are present.

Treatment.

The treatment of an attack of chorea may be considered under three heads:

(1) Rest and the preservation of nutrition;

(2) Medicinal treatment;

(3) Mental and bodily hygiene.

If the treatment of an attack be carried out with the necessary attention to each of these three requirements the vast majority of choreics will recover without sequelæ or permanent injury to the nervous system. As a matter of fact the reason why chorea leaves its impress upon the nervous system so often is that most physicians content themselves with giving medicines alone, which, if not least important, is not of more value than the first and not much more than the last. Chorea is, like rheumatism—the disease which it resembles and which it often follows—a self-limiting one, and if the patient is placed under favorable auspices he will recover in a period varying from eight to sixteen weeks.

The importance of *rest* in contributing to the early termination of the disease cannot be overestimated, nor can the carrying out of it in the first part of the disease be overdone. It is very difficult to get little patients to remain in bed all the time, but a compromise can usually be affected by having them arise late, go to bed for an hour or more in the afternoon and retire early in the evening. Many of them are in a run-down, mentally overwrought condition, the result of persistent study, attendance at school, improper nutrition, etc. Consequently rest and freedom from all sorts of excitement is the most rational prescription. As has been hinted, it is most important that rest, freedom from motor activity, be obtained in the afternoon, if

possible, for it is at that time in the twenty-four hours when destructive metamorphosis of the bodily tisues goes on with most activity, and to counteract this is the great desideratum. The question of taking the patient from school should always be answered in the affirmative, and after an attack there should be no haste in the resumption of school duties, particularly if they are at all trying and if participation in them be attended with any great strife, such as is fostered by the reward-of-merit system in many of our schools. The mental discipline and bodily hygiene of these patients must be carefully attended to after an attack of chorea, with the view to avoid a second attack and to prevent a tendency or disposition to nervous affection.

The *nutrition* of the patient is to be fortified by the administration of digestible and assimilable nutrition in small quantities, repeated with moderate frequency, and for this purpose an ordinary mixed diet with a relatively smaller proportion of animal proteids is most useful. If the child has not yet reached the age when a mixed diet is usually given, absolute restriction to a milk diet should be insisted upon.

I have found that one of the best measures in contributing to the maintenance of nutrition and at the same time to the quietude and comfort of the patient, is the shock and counter-irritation of cold water poured from a height or thrown forcibly against the back of the neck and spine once or twice a day. I have also had the most salutary results, when the motor unrest is very great, from the use of the wet pack, especially before retiring. It is not only soothing to the patient but contributes to refreshing sleep. For this purpose it is more serviceable than hypnotics and has the advantage that it has no after-effects except gratifying ones. After the first one or two applications children do not rebel against it; in fact, they enjoy it.

Drugs.—The medicines that are of service in chorea are few in number. This bespeaks their real value. If no one medicament were of signal value, the number which might be recommended would be legion. The three drugs which are of real service in the treatment of an attack of chorea are arsenic, exalgine, and quinine, and their relative value is indicated by the order in which they are mentioned. This enumeration does not of course include such medicines as iron, which is an integral part of the blood and which it is necessary to give in nearly every case of chorea.

Arsenic is by far the most efficacious therapeutic substance to influence the severity and course of an attack. It may be given in the shape of Fowler's solution preferably, or the arsenate of soda. It can be given in comparatively large doses, even to the production of slight toxic effect such as puffiness around the eyes, nausea and vomiting, lachrymation, etc., but as soon as these symptoms appear

administration of the drug should be withheld until they cease, then the drug should be given again, in the same dose that was being given when the toxic symptoms occur. It will be found that the patient tolerates the renewed attempts at the large doses without any complaint. The dose of Fowler's solution for a child of from six to ten years may in this way be brought up to from 10 to 15 drops in a few days. Personally, I have rarely given the extremely large doses recommended by Seguin, nor do I think that they are necessary. When the choreiform movements are of great severity and when they do not promptly subside under the administration of arsenic, and the influence of enforced rest, I have not failed to get the required effect from a few doses of exalgine.

Exalgine has never, apparently, been very extensively used in the treatment of chorea, yet it is a potent medicine to abbreviate the duration of an attack. It may be given in doses of from $\frac{1}{2}$ to 3 grains to children under ten years, and repeated three or four times a day. The effects of the administration of exalgine, not only on the severity of the symptoms but upon the patient's appearance and vitality, are generally manifested very promptly, and to one unaccustomed to its use the latter, if the drug has been given in large doses, may make him somewhat solicitous. The hæmolytic action of exalgine is responsible for the early appearance of anæmia, and this, as well as the direct effects which it has on the circulatory apparatus to lower blood-pressure, sometimes produces a condition akin to collapse. The occurrence of these symptoms can in a large degree be prevented by administering some soluble salt of iron very freely from the very beginning of medication. I have not seen bad results follow the administration of exalgine, although in cases that have been unamenable I have carried the quantity of exalgine administered up to 30 grains in twenty-four hours, at the same time administering most liberal doses of iron. It may not be amiss to remark that when the drug is given in extremely large doses epileptoid convulsions may occur. Naturally the greatest care must be taken to avoid any such occurrence. To secure the beneficial effects of the drug it is never necessary to give it in doses approaching those required to produce these serious symptoms.

Exalgine is of greater service in the very acute cases than those that have lasted for some time, and it can often be used to advantage in the beginning of an attack, and arsenic later. Were it not for the profound anæmic and collapse symptoms which it causes—for which, as I have said, iron, and sometimes digitalis must be administered—the drug could be recommended more warmly than I think fit to do.

Quinine, the *salicylates*, and *antipyrin* have all been very largely used in the treatment of chorea, and frequently with the most satis-

factory results. It is supposed that they owe their beneficial effect to their action on the blood, it being well known that they have a direct action on the white corpuscles and the blood plaques, and by contributing to intestinal antisepsis. Speaking in broad terms, intestinal antisepsis is a myth, and should be considered in mythology, not in therapeutics. Their administration is recommended, in becoming doses, in cases in which it does not seem wise to administer either arsenic or exalgine, and particularly in cases where there is a distinct rheumatic history.

Dana has recommended anodal galvanization through the skull, but this procedure has apparently not been adopted, nor have I met a case in which I deemed it necessary to use it.

A combination of chloral and bromide is often of service when the motor activity is extreme and to aid in securing sleep, but, if the wet pack be applied and the discipline of keeping the patient in bed be pressed into service, there will rarely be any need of using the chloral-bromide mixture. I have had most satisfactory results from the use of the bromide of zinc in cases of long standing, particularly in those cases where the patient has run the therapeutic gauntlet before coming under observation. It may be given in doses of 5 to 20 grains three times a day.

Occasionally the administration of some preparation of belladonna or hyoscyamus, especially in cases where the vesical sphincter is derelict in the performance of its duties, is of advantage. Measures must often be taken to overcome constipation, which the profound asthenia of chorea is directly contributory to, and which the administration of iron increases, and the appetite must be prodded.

The *mental disturbances* of chorea have been the subject of considerable writing. Except as a part of the asthenia of the *soma* and the *psyche* mental disturbances do not exist, and such symptoms of mental impairment as aphasia, forgetfulness, or intellectual sluggishness require no treatment apart from that taken to combat the general weakness. It should be borne in mind that all the functions of the organism are perverted in this disease in the same manner as in rheumatism, and the patient should be treated accordingly.

A severe form of Sydenham's chorea occasionally occurs with *pregnancy*. It demands active and vigorous treatment from the start, otherwise it will result in such a condition of bodily weakness that the patient will either abort spontaneously or the necessity of terminating pregnancy will become paramount. In these cases there is no difficulty in putting the patient to bed as there is so often in the case of young children, and this as well as the arsenic plan of treatment should be thoroughly carried out. If the severity of the symptoms is mitigated promptly the patient may be allowed to go about,

and the prospects are that complete recovery will soon follow. If the symptoms are so severe that the life of the patient is in jeopardy there should be no hesitation in removing the contents of the uterus.

Chorea of *adult males* occurring for the first time is an extremely rare condition, and does not call for specific mention in regard to its therapy.

The subacute type of Sydenham's chorea very often requires a plan of treatment not unlike the rest cure so often beneficial in cases of neurasthenia the result of overwork. In fact, the rest cure, or a modification of it to which is added the use of arsenic, is the treatment advised. Bromide and chloral have no place in the therapy of the disease other than to combat symptoms, and are never to be given for any length of time. Iron, arsenic, zinc, antipyrin may be given internally, and various forms of electrical and hydriatric treatment externally; but permanent amelioration, even, cannot be promised from any one of them. Sometimes the actual cautery to the back of the neck and vertebral column has seemed more efficacious than anything else at the Post-Graduate clinic.

This form of chorea should not be confounded with chronic degenerative chorea: the former is an eminently curable condition, while the latter always goes on to mental decay and eventually physical dissolution.

One attack of chorea predisposes to another. This should prompt the physician to take measures to prevent a relapse, and particularly in the spring and summer, when the majority of cases occur. Attention to the general nutrition, proper use of gymnastics and massage, interdiction of excessive mental application, and intelligent mental and physical discipline will go far toward placing the patient beyond the danger of relapse.

The infectious disease which Dubini described in 1846 under the name of chorea electrica, and which is now usually referred to by his name, is confined almost exclusively to northern Italy, and is a very fatal disease, at least 90 per cent. of cases terminating in death. No treatment has yet been suggested that diminishes that frightful mortality.

The disease known as Bergeron's chorea, also sometimes associated with the name of Henoch, occurs in nervous anæmic patients of neuropathic heritage. It is sometimes apparently attributable to fright, excessive emotion, etc. It is more properly considered as a form of generalized tic. It develops quickly and abruptly; the choreiform movements are of an electric nature, most often in certain muscles, as of the face, the neck, and the shoulders, and are often accompanied by symptoms referable to the stomach, indicative of distention and

of rhythmical movements in its walls. The symptoms cease during sleep.

The treatment is the administration of an emetic and measures taken to assist the stomach to properly functionate, and general tonic measures to facilitate the return of perfect nutrition. Huntingdon's chorea, a degenerative disease of the entire nervous system, of a familiarly nature, is neither prevented nor benefited by treatment. The mental defects which its victims develop demand hospital treatment.

PARAMYOCLONUS MULTIPLEX.

PARAMYOCLONUS MULTIPLEX is the name given to a form of myoclony which was first described by Paget as a form of chorea electrica in 1847, but which is associated now with the name of Friedreich, he having described it anew and with great detail in 1881. Paramyoclonus multiplex occurs usually in adult life, most often in those of neuropathic inheritancy, and is characterized by the occurrence of abrupt, involuntary contractions similar to those produced by an electric shock; these may be somewhat localized in their manifestations, but never systematized or rhythmical, and they are repeated at variable intervals. The myoclonus is the striking symptom, but it is not the only one, for almost all suffering with this disease have symptoms of a mild form of melancholia, neurasthenia, or hysteria.

The disease is of uncommon occurrence in this country.

Paramyoclonus multiplex forms one of the members of the class of false chorea, of which variously described forms of electric chorea, such as fibrillary chorea, chorea of Bergeron, of Henoch, etc. are close relatives, of degenerative types. The term myoclonus is often very properly used to cover them all.

TREATMENT.

The treatment of paramyoclonus is, first, treatment of the neuropathic state; and second, treatment of the tonic, clonic, or fibrillary contractions by which it is manifested.

It is unnecessary to detail here, even if space warranted it, the methods that may be employed to combat the first. Hydrotherapy and massage have of latter years been extensively used to overcome the functional nervous diseases. Paramyoclonus multiplex is one of the diseases in which neither baths nor the douches seem to have any beneficial effect. The most important measures in the treatment of the general condition are those taken to maintain bodily nutrition and strength, and those to circumvent mental introspection and depression. A methodical tonic, hygienic course of treatment will fulfil the first

requisites, but the latter is not so easy. The very nature of the disease and its chronicity prevents travel, sports, amusements, and the relaxation to be obtained from them, and often institution-treatment such as offered by a thoroughly equipped sanatorium is advisable.

Of the measures that can be taken to relieve the severity and frequency of the material manifestations, the first place is held by electricity and the second by hyoscyamus, neither of which, however, is specifically curative. When cure results in these cases, it is from the combined effect of general hygienic, dietetic, and tonic measures, associated with active treatment by the physician.

Electricity is best applied by means of central galvanization, one electrode being placed over the spine and the other on successive parts of the member in which the clonus is manifest; generally the upper or lower extremities are involved, although the face may be affected. Often striking amelioration is the result of careful, persistent electrical treatment.

Hyoscyamus may be given internally or hypodermically in the form of hyoscine hydrochlorate; it should not be kept up for any considerable time, as the effects of it are demoralizing to the integrity of general nutrition. Any form of hypodermic medication is to be avoided in patients ill with functional nervous disease, and this disease furnishes no exception to the rule.

On account of their proven efficaciousness in true chorea, arsenic, quinine, and antipyrin have frequently been recommended. Their administration may sometimes be indicated to fulfil particular purposes, but, all in all, they have no place in therapy of the disease other than as symptom-medicines.

Drugs that are of repute in the treatment of hysterical affections, such as the valerianates, zinc salts, etc. do not seem to have the slightest influence on the course of this disease. The subcutaneous administration of atropine and cocaine is mentioned only to be condemned.

In a general way it may be said that the great majority of sufferers from paramyoclonus multiplex will either completely recover under the plan spoken of, or they will have the severity of their symptoms so mitigated that they are very comfortable.

LOCALIZED SPASMS AND GENERAL SPASMODIC AFFECTIONS KNOWN AS SIMPLE AND CO-ORDINATED TICS.

The name *tic* is applied to an abrupt, lightning-like contraction of individual muscles or groups of muscles which act together to

fulfil some physiological purpose, reproducing in an exaggerated form some physiological act. Any such movement, it matters not how slight or how extensive, varying from the slightest blinking movement of the eyelids up to the most complex co-ordinated movements associated with obsession and apparent manifestation of psychical activity, may be considered a tic. Tic is a special form of myoclonus, and clinically it is comparable to other forms of myoclonus such as paramyoclonus multiplex and chorea electrica, although genetically these diseases may be different. They are properly considered as the expression of a degenerative neurosis, and the tendency to their occurrence is often clearly inherited.

The simplest forms of tics, whether of the face or the extremities, are so closely imitative of some familiar purposive movement, such as blinking, sniffing, hemming, etc., that they are frequently referred to as habit choreas or habit twitching. Such a reference may be of some service to indicate that they develop occasionally after long-continued purposive or imitative repetition, but if the use of such a term carries with an expression of opinion that this is their only cause it is to be deprecated.

Tics may be classified as—

1. SIMPLE, LOCALIZED TIC, which may include simple twitching movements of the various parts of the face, such as the eyelids, the side of the face, the ala of the nose and the corner of the mouth, tissues, spasmodic wry neck, twitching of an individual muscle or group of muscles of an extremity; and twitching, spasmodic movement of the diaphragm, which forms a variety of what is sometimes described as respiratory spasm.

2. GENERALIZED TIC.—These tics include not only the cases of electric chorea that we have referred to, but also those cases in which the tic is more or less universal in its distribution and the movements are not co-ordinated.

3. PSYCHO-MOTOR TIC, of which there are to be distinguished two distinct types: first, one in which the movement is the motor response of some distinctly formulated idea or thought, usually called an obsession; and, second, a complex co-ordinated tic (*tic co-ordiné* of Gilles de la Tourette), a more or less generalized tic frequently coupled with the production of definitely articulated sounds and words or rapid repetition of words, recurring utterances which are expressive of the feelings or emotions and not of cognitions or thoughts. When they assume the form of recurring utterances they are called echolalia; when they are filthy and obscene, as they often are, they are termed coprolalia.

Varieties of this affection have been described in different parts of the world under different names: in the Orient as *latah*, in Russia

and Siberia as *myriatchit*, in Canada and Vermont as "the jumpers," and in general as "saltatoric spasm." *Tic convulsif* is apparently becoming the universal designation.

Treatment.

The treatment of the neurosis of which the tic, its various manifestations and psychical equivalents are an outward expression is one of the most unsatisfactory tasks that the physician can set himself. The treatment of all the degenerative neuroses requires great therapeutic tact and fertility of resource, but this one above all others calls for their possession in a high degree.

Simple Tics, or Localized Spasms.—*Trismus and Facial Spasm.*—The simple tics of the face are never painful, and are annoying largely from an æsthetic point of view, and can often be combated if the treatment is begun early and adhered to. In every case of blinking and twitching of the frontalis and corrugator supercilii the refractive state of the eyes should be carefully inquired into, and if defects are found they should be corrected. If the patient be a child it should be removed from school for a time and encouraged to voluntarily restrain the movements. In some cases the discipline of partial isolation is of service. As a general rule, however, the best results will be obtained by making the patient lead a rollicking out-door life while at the same time a course of tonics and iron is administered, and those who come in contact with the sufferer are instructed to take no notice of the movements. Intimidation, recommended by Trousseau, should never be employed. In some instances instillation of cocaine into the eye and the internal administration of belladonna may be serviceable for the temporary relief of the condition, and will make an impression upon the patient.

Convulsive twitchings of the muscles of the face occur almost always in mature and late adult life, and to treat them satisfactorily one must make a diligent search for the cause and remove it if possible. In some instances twitching in the musculature of the seventh nerve is reflexly produced by irritation of some branch of the great sensory nerve of the upper part of the body, the fifth, and in every case an examination for such a source should be made. The organs of special sense, the teeth, and the condition of the nerve itself should be passed in review. Individual patients will recognize that the tic is aggravated by certain mental and physical conditions, which they soon learn to avoid, and which the physician should take cognizance of.

The general health in many patients who have facial spasm is materially impaired, and oftentimes measures directed to increase of nutrition and physical strength will materially improve the

patient. In some cases occurring in late adult life evidences of arterial degeneration are to be detected, and in one such case under my treatment I have had very happy results from the administration of nitro-glycerin. Almost every drug and measure that has ever been reputed to have any anti-spasmodic virtue has been tried for the relief of this annoying trouble, but there is very little encouragement for the selection of any one of them over all the others. The hypodermic use of morphine will relieve the twitching temporarily, and it has been recommended that the patient should be kept under the influence of the drug thus administered for a prolonged time. There is danger in such procedure, and the patient can never be promised that the cessation, which it rarely ever fails to cause, will be a permanent one. The danger of contracting the habit is enormous, and the disease is infinitely to be preferred to the latter. Injections of strychnine in moderately large doses directly into the seat of the twitching I have sometimes found of service. I have never seen any benefit from conium, which is sometimes very useful when given in large doses in spasmodic torticollis, nor from gelsemium. The most serviceable nervine or combination would seem to be a combination of arsenic and belladonna given in doses sufficient to produce slight physiological effect and kept up for a long time.

Electricity in the shape of the galvanic current (the negative pole at the back of the neck, the positive pole immediately in front of the ear, and a current of two or three milliampères allowed to pass for from ten to fifteen minutes) occasionally lessens the severity of the twitching while its administration is kept up; permanent benefit is not often attained from this, but it may be used as an adjuvant to other measures.

Stretching the facial nerve has been done many times. Anything short of a surgical operation and thorough stretching is not of the slightest effect and even then the results of the procedure are not very encouraging—the cases almost always relapse after a variable time. Occasionally, when the tic is very severe and no amelioration can be got from other measures, this procedure should be resorted to, and active treatment be kept up afterward even though the twitching has entirely ceased.

Occasionally, temporary relief is obtained by a small blister behind the ear, by pressure on one of the larger branches of the facial nerve where it comes to the surface on the face, and by the application of the actual cautery to the back of the neck, but the most satisfactory results can be expected from a persistent effort directed to improvement of the general tone and nutrition and the symptomatic administration of nerve-sedatives.

In several cases of facial tic associated with *nuchal tic*, spasmodic rotatory and lateral *torticollis*, I have seen prompt amelioration follow suspension of the patient from the head by means of the head-piece of the apparatus constructed to suspend tabic patients, and practically the same as that used by the surgeon in applying the plaster corset-splint.

Suspension is oftentimes an important alleviating measure in the treatment of idiopathic torticollis, it matters not in what direction the movement be, whether lateral, backward, or rotatory. Associated with the hypodermic administration of atropine in large doses or of fluid extract of conium by the mouth, sixty drops in twenty-four hours, it often secures complete relief. Naturally such conditions are liable to relapse, and this should be guarded against by the administration of arsenic, quinine, and iron, and the symptomatic use, if necessary, of hyoscyamine, gelsemium, chloral, and bromide. The galvanic current has about the same chance to give relief in this affection as it has in facial tic. It is never more than an adjuvant. Massage, however, is often of real service. In extreme cases resection of the spinal accessory nerve and of the posterior branches of the upper four cervical nerves has been resorted to with fairly good results, but partial section of the sterno-cleido-mastoid muscle is to be preferred if surgical measures are necessary.

The general treatment of *tic of the legs*, the so-called "spring-halt tic" does not differ from that of any of the other simple tics. On account of the facility with which the cold pack can be applied to the extremities, and the soothing effect which it oftentimes has, the local treatment can be carried out with better chances of relief. This is the most efficacious of hydriatric procedures for this condition, but sometimes a warm douche against the parts, and kept up for a long time, will be of service.

Spasm of the respiratory muscles and *tic of the diaphragm*, which are most commonly associated with the production of a loud explosive sound—such as "heim"—repeated from ten to thirty times a minute or oftener are happily not frequent. Two cases that have been under my care during the last few years have proved entirely unamenable to every form of treatment. In one of the cases where the sound was so loud that it could be heard all through the house, the patient was kept under the profound influence of opium for several weeks without the slightest benefit. She was then isolated and put on a tonic plan of treatment; this not being followed by any results, gradually increasing doses of dilute hydrocyanic acid and afterward hyoscine, were given, and so on until every conceivable therapeutic measure was tried, without the slightest benefit. All treatment was then given up, the patient was studiously neglected and sent into

the country, but the results were always the same. After nearly three years' duration the attacks suddenly ceased while the patient was taking large doses of copper.

CONVULSIVE TICS; CO-ORDINATED TICS.—Treatment of psycho-motor tics should be directed particularly to the development and maintenance of mental equilibrium. This cannot be attained by the utilization of any one measure; the various therapeutic procedures —such as hydriatric measures, exercise, occupation, change of surroundings—must be combined with disciplinary measures of isolation, regularity, and obedience. In the simpler forms of the disease, such as rolling upward movement of the eyes in rapid succession, or quick successive tappings of the toes or the fingers, or quickly repeated movements of the head toward one side, all in response to some formulated idea, I have been successful in some cases by the utilization of these measures and at the same time the employment of mental suggestion after the patient had been carried into a state of mental receptivity that such suggestion was not spent on barren soil. In one case I first suggested to a patient who had compulsory movements of looking toward the horizon to substitute for these a movement of pressing the toes against the sole of the boot. After this was accomplished I suggested that he should have the mental accompaniment of such a movement without the actual muscular contraction. After he became convinced that this was possible it was easy to dispel them altogether.

The severer forms of psycho-motor tic are usually incurable and we must be content to secure amelioration. Some benefit may at times be derived for almost any one measure, such as hydrotherapy, central galvanization, rest in bed, isolation, etc., but the greatest benefit is to be expected when these are combined and when they are accompanied with intelligent disciplinary measures directed immediately to the mental sphere.

In some cases of generalized tic in which the convulsive movements are neither co-ordinated nor accompanied by psycho-motor explosions, much benefit is to be derived from careful persistent treatment, medicinal and gymnastic. In some of these cases it is seen that the convulsive movements do not occur during the performance of some complex purposive acts, and by this I mean acts that have not become so completely involuntary as walking and the like. For such cases regular methodical work in a gymnasium, with persistent practice of exercises requiring careful co-ordination, absorbing occupations such as bicycle riding and learning to dance may be essayed, and sometimes with benefit. In one case of severe generalized tic now under observation I am sure that a patient has derived marked benefit from patient and long-continued trials to learn to ride

the bicycle, from indulgence in this form of exercise since then, and from the internal administration of nitrate of silver. The latter drug given in from $\frac{1}{8}$ to $\frac{1}{4}$-grain doses, is, I believe, one of the best alteratives in this neurosis. Its administration should be alternated with salts of gold and of copper, and of the iodide of potassium.

EPILEPSY.

Before discussing the treatment of epilepsy it is necessary to be explicit about the forms of this neurosis. The symptom epilepsy has been variously classified according to its origin, its etiology, the time of life at which it appears, its symptomatology, its purity, and its complexity. Clinically, epilepsy is divided into *petit mal*, *haut mal*, psychical epilepsy and epilepsy procursiva, periodical sleep-seizures of an epileptic nature, etc. Such a classification is of service to illustrate types of the disease, but it is of no aid in determining a plan of treatment. The neurosis epilepsy, it matters not what clinical form it assumes, predicates, if I may be allowed to project the theory, a similar diseased condition in all cases, it matters not what the outward form or manifestation of the disease may be, and requires practically the same treatment. The division of epilepsy into organic and functional is a convenience. If our theory of epilepsy, a theory now supported by many scientific pathological demonstrations, is correct, this division is necessary until we are able to refer the symptom epilepsy to a firm anatomical basis. In truth, a modification of the division of epilepsy into organic and functional is a most serviceable one.

In discussing the treatment of epilepsy I shall describe, first, the form of epilepsy that occurs before the age of maturity, generally manifesting itself before the time of puberty, without direct causation except what may be attributed to heredity, to consanguinity, parental vice, and to some non-sufficient exciting cause such as fright, great anxiety, excessive mental application, etc. This is the kind of epilepsy to which the name idiopathic has been given, in lieu of a more accurate term to indicate its causation. At the present time these cases are referred to as hereditary epilepsy, primary epilepsy, idiopathic epilepsy. Just what proportion of all epilepsies this form constitutes, it is difficult to say. I feel sure, however, that unquestionably the great proportion of all cases of epilepsy that develop before puberty are usually placed in this category, but it does not include very many, or, better said, any considerable proportion, of the epilepsies that develop after the period of maturity. To be more

explicit, it is impossible to say just what proportion of cases of epilepsy that develop before the age of puberty is associated with congenital and acquired defects which are either so slight, or have been so compensated by a process of repair, that no manifestation except epilepsy is present; and, on the other hand, how many are dependent upon defective development of the proton, upon congenital and post-natal developmental shortcomings.

In the vast majority of cases that develop after maturity epilepsy is a symptom of some organic disease of the brain. Year by year the cases of purely congenital "idiopathic" epilepsy are becoming fewer, while the category that embraces epilepsies due to encephalitic conditions, injuries, and cerebral infantile epilepsies is becoming more comprehensive. The epilepsy that is termed organic is known, when the organic processes are limited and focal, as Jacksonian, cortical, or focal epilepsy, and when the organic process is not focal or localized as general epilepsy. It needs to be emphasized that the term Jacksonian, as generally used, does not apply to the process, but to the clinical manifestation.

Jacksonian Epilepsy.—The focal organic epilepsies occur most frequently in adult life, except when they are the expression of new growths, post-meningeal cicatrices, meningeal and cortical hæmorrhages, and other accidental conditions which may occur at any time after birth. In adult life this form of epilepsy is most frequently the expression of traumatism to the skull, setting up localized pathological changes, gummatous meningitis of the convexities, leptomeningitis, endarteritis, localized gummatous formations, or all or some of these lesions combined, constituting cerebral syphilis. Naturally, the same factors that we have mentioned as causative of organic epilepsy in the child may be operative in the adult and result in similar conditions, and will be manifest by symptoms of the same type and form.

Reflex Epilepsies.—Epilepsies that are symptomatic of some form of central or reflex irritation are not common. Such epilepsy may result from irritation of areas of the brain which are not considered strictly motor, from hydrocephalus, from toxæmic conditions such as uræmia, diabetes, and absinthe. On the other hand, a similar epilepsy may be the result of some form of peripheral irritation, and particularly from irritation of some special sense or highly endowed organ of tactile sensibility, such as the sexual organs. I believe that this brief statement represents all that need be said of so-called peripheral epilepsy, but, for fear of misconstruction, I desire to say that the epileptic manifestation which may follow continued irritation of some peripheral sense-organ is in no way a disease comparable to primary, to congenital, to organic epilepsy, or even to a toxic epilepsy. As I

construe it, the epileptic attack or attacks which result, very rarely it must be said, from peripheral irritation are probably a clinical manifestation of a genuine neurosis, or of a general neurotic condition, which, however, might not display itself by convulsive phenomena if the peripheral irritations did not exist.

The reflex epilepsies should not be considered in too great detail, even to deny their more than rare occurrence compared with the entire number of epilepsies in which no cause can be discovered. Their consideration by enthusiasts and "faddists" has already done immeasurable harm, and the past history and literature of reflex epilepsies, as well as the makers of such histories, deserve to be speedily forgotten. No honest, properly trained physician ever fails to completely examine a patient, and, if he discovers a condition of the foreskin that interferes with its proper function, he removes it just as he would remove a thorn from a man's foot if he found that it interfered with his walking. But this does not prompt him to tell the profession of his success in curing people who are unable to walk, nor does he desire to be considered an orthopædic surgeon. No more should a physician who amputates a foreskin or releases an adherent clitoris and so destroys a source of peripheral and central annoyance, claim to be the discoverer and possessor of a new method in the treatment of epilepsy. In my opinion, the most dangerous specialist in the treatment of epilepsy to-day is he who claims to cure his patient by partial, complete, multiple or repeated tenotomies of the eye-muscles. Before going farther, I hasten to disclaim any prejudice either against the men who have made or are making such claims, or their methods, but it does not seem to me that a person who has examined into this matter carefully can be led to any other conclusion.

There is some slight evidence that patients afflicted with epilepsy are also the possessors of refractive anomalies more frequently than are their fellow-beings who are not epileptic, but the truth is that such ocular imperfections are but one of the somatic stigmata of degeneration and should be classified with the prehensile finger, the bullet-shaped head, the Darwinian tubercle, the Lamarckian hypophysis, the torus palatinus, and the many other defects which statistics prove beyond cavil are the natural possessions of the epileptic. I believe, further, that such muscular insufficiencies and refractive shortcomings should be corrected in epileptics the same as they should be in those who are not epileptics.

Theory of Epilepsy.—The theory that best explains attacks of epilepsy is the theory that postulates the existence of a histological neural entity; that is, the anatomical element or unit, the neuron with all its structural completeness, the cell, the neuraxon, the terminal arborization, and the terminal endings of the dendritic processes. Any

organic disease or any injurious condition which has not yet produced sufficient changes to be considered a disease, that interferes with the nutrition of this anatomical unit, and particularly of the terminal arborization of the dendritic processes, be they developmental, accidental, or degenerative, diminishes the functional ability of this part of the nervous system and thus causes a diminution in the potentiality of these structures, which is manifested intermittently by the liberation of energy, which liberation is sometimes termed an explosion of motorial force—or, in short, an epileptic attack.

This theory may be amplified and modified to explain the various clinical forms of epilepsy, be they motor, psychical, sensory, procursive, explosive, equivalent, petit mal or grand mal. And, on the other hand, without doing violence to the tenets of the theory, we may explain according to it the efficaciousness of the most useful plan of treatment—the only plan, in fact, that is of any considerable service in true epileptic neurosis, *i. e.* the bromide plan.

General Treatment of Epilepsy.

A consideration of the philosophy of the treatment of epilepsy is no inconsiderable aid to the proper application of medicinal agents, and to it I shall revert later.

The therapeusis of epilepsy varies according to the form of epilepsy. The plan of treatment that is applicable to primary, so-called idiopathic, congenital epilepsy is not the proper treatment for syphilitic, traumatic, accidental epilepsy; nor is treatment of either of these appropriate for the epilepsy which is dependent upon purely degenerative processes, such as parasyphilitic, post-cicatricial, etc., degenerations.

The treatment of epilepsy should be subdivided into the moral and hygienic treatment, which includes the diet, the discipline, the education of the patient, and all that these imply; and, secondly, into the medicinal treatment, which should include not only the drugs employed but the time of administration, mode of administration, *i. e.* the vehicle, the uniformity of the solution used, and the measures taken to offset disagreeable effects of treatment.

Experience has taught me, and I am sure it has taught others who have had a considerable experience with this disease, that the reason why physicians fail so often to effect such pronounced amelioration, not cure, of the disease as to satisfy patients and their families, is because they neglect almost entirely the moral and hygienic treatment and depend for their success—a fatuous ambition—on the administration of medicines alone. The result is failure. I am sure I echo the sentiments of many practitioners when I say that they dread the visits of an epileptic patient after they have had several trials at attempting to cure him.

Moral and Hygienic Treatment.—The *moral treatment*—by which I hope I shall not be understood as implying only the application of the canons of ethics, for I use the term in its widest sense—is particularly adapted to the primary congenital variety. This kind of epilepsy occurs most commonly at an age when the disciplinary measures are most efficacious. Habits of obedience, of the restraint of passions and appetites, of emotional equanimity, of temperate mental activity and industrious application should be instilled. The education of these unfortunate beings should not be neglected; on the contrary, it should be assiduously cultivated. The education should not alone be of the mind, but of the senses, and particularly of the hands. Many epileptics, if properly trained, become artisans, masters of handicraft, and laborers sufficiently skilful to earn a livelihood and frequently to compete with their non-handicapped fellow men. Modern methods for the education of backward children, teaching mainly by the aid of environment, are the best means to this end. Hand in hand with this must go the education of the body. If these children manifest any special predilection or ability for certain occupations, providing such do not involve excitement and strain, they should be fostered, while at the same time the bodily and mental life are cared for. Such details may seem pedantic, but the utter hopelessness of these cases, if they are allowed to go on without other and more intelligent surveillance than that of the ordinary parent, warrants them. The enthusiastic pedagogue and the intelligent physician must work together to make the best possible citizen out of the defective epileptic child. Institution-treatment, where all these forms of moral, mental, and physical development can be carried out, is a good one, in fact it is ideal. The necessity of beginning the education and treatment of an epileptic before the disease has continued for a certain length of time, before what may be conveniently called the "epileptic habit" has developed, is very essential.

The *hygienic treatment* of epilepsy is embraced in the regulation of the mode of life of these patients, their habits, indulgences, diet, exercise, movements, occupation, and the assumption and discharge of special functions and obligations. Climatic conditions do not seem to enter into the treatment of epilepsy.

The mode of life of an epileptic patient should be one that allows him to be free from care, untrammelled by any considerable responsibility, and one that is conducive to mental equanimity. The contraction of all habits, unless that of uniform occupation be considered a habit, must be deprecated. Tobacco, alcohol, and other unnecessary luxuries which may easily be made injurious are to be absolutely interdicted. Although it is impossible and frequently impolitic, for a physician to in any way interfere with the development of the normal

passions, such as love, engagements, etc., marriage for the congenital epileptic is to be severely frowned at. Any form of exercise that is not attended with great physical effort, or that will not jeopardize the patient's life or limb if an attack of epilepsy should occur while he is participating in it, is to be allowed and recommended. Of the sports, that of golf, perhaps, in which no other strife need enter than the prompting to outdo one's self, is the ideal one, although I have more than a few epileptics who engage in bicycling and other popular and pleasurable forms of exercise. It is a fact well known to every physician that unusual care must be taken to keep the physical condition of an epileptic up to that of an ordinary person who does not take any exercise or gymnastic drill for its maintenance.

What has been said of exercise applies also to amusements. There are very few amusements that an epileptic should be prevented from enjoying. Theatre-going in moderation, especially in the afternoon, social intercourse if the mental state of the patient allows it, parlor games, and the like, all contribute to vary the monotony of existence. The assumption and discharge of social functions by epileptic individuals will vary with each individual and will have to be decided by the physician according to the development of the patient.

In a word, it may be said that if a person who has epilepsy is capable of discharging social or political duties, none except that of marriage should be advised against, providing they do not interfere with the regularity and methodical arrangement of his life. The nature of the disease requires that for its treatment large quantities of a medicine which acts as a powerful depressant be taken for a long time. In order to overcome the peccant effects of this substance, Nature's best restorer, sleep, should be obtained in liberal amounts.

Diet in Epilepsy.—More important than all, perhaps, and very much more important than any one thing, is the question of diet. Like other functions of the body in epileptics, that of alimentation is frequently impaired, and this combined with defective inhibition and restraint of the appetite, frequently results in the most disastrous dietetic consequences. At one time it went abroad, and even met with acceptance in some quarters, that nitrogenous substances such as meat should not be consumed by people suffering from epilepsy, or, if so, then in the greatest moderation; and those who recommended such a plan were often able to fortify their claims by statistics which showed that the number of epileptic attacks in an individual who was not allowed to eat meat was considerably less than when he so gratified his appetite. The *post hoc propter hoc* of this argument is, however, a most fallacious one: cutting off the animal food very frequently gives the over-burdened digestive tract an opportunity to rest and causes a partial cessation of

the accumulation of the products of incomplete digestion which, on being absorbed into the system, exercise a pernicious effect upon the highest nerve-centres; and thus apparent benefit for a time seems to result from eliminating them from the dietary. Far greater benefit, however, is secured when the entire dietary is subjected to the physician's scrutiny. Epileptic patients should be given a mixed diet; neither the animal nor the vegetable products, nor the starches, nor the fats should predominate, nor should the one be taken to the exclusion of the others unless some special reason for such exclusion exists. Fermentable substances of diet, like starches and sugars, substances difficult of digestion and which, when digested, contribute but little to alimentation, tea, coffee, etc. are to be avoided. If all other treatment of epilepsy than that directed to the regulation of the alimentary canal and the maintenance of a normal digestion with a high state of nutrition were weighed, it is probable that more benefit then would follow than from the administration of the best medicinal anti-epileptic measures alone while dietetic errors were rampant.

Medicinal Treatment.

In speaking of the medicinal treatment of epilepsy I shall keep in mind a typical case of primary or congenital epilepsy, for this is the form in which medicinal treatment is attended with any sort of success. It is also the kind the treatment of which is most dependent upon medicine. As I have said before, I believe that the reason why so many cases of epilepsy under the care of the general practitioner are not very much benefited for all time by treatment is that although the prescribing of drugs may be unimpeachable, yet proper attention to the mode of administration, intelligent persistency, and careful attention to the details hereinbefore mentioned are not combined with such exhibition of medicine.

The Salts of Bromine.—*Their Utility.*—The one great measure in the treatment of epilepsy is the *salts of bromine.* If all other drugs which have a reputation as anti-epileptic remedies were lost to the profession, the results of treatment by this measure alone would be as good as they are to-day.

It does not seem to me that the selection of any particular salt of bromine is of such importance as to merit considerable discussion. By some, perhaps by the majority, bromide of potassium is considered the equal if not the superior of any of the other bromine salts. On the other hand, many prefer the bromide of sodium, not alone because it is more agreeable to take, but also because it is less apt to derange the stomach and because of its greater percentage of bromine. Bromide of strontium has been very successful in the hands of some practitioners. As a matter of fact, it is best to begin the treatment of

epilepsy with either the bromide of sodium or the bromide of potassium and, if these are not well tolerated or as efficacious as they should be, another salt of bromine or a combination should be tried. I have never been able to satisfy myself that a mixture of the bromides possesses any particular advantage over the individual salts, and, as Seguin has pointed out, the use of the single salt of bromide allows of the maintenance of a standard solution which can be used to great advantage.

Physiological and Toxic Effects of the Bromides.—In order to administer the bromide successfully, the physiological action and the toxic effects of the drug should be well in mind. It is not important, perhaps, to consider either of these here except incidentally. Such information can be obtained in any text-book on therapeutics. The common acute toxic manifestations of the drug are the eruption of acne, sometimes the production of very striking trophic changes going on to ulceration, bromine-inebriety characterized by vasomotor inhibition which may extend to very considerable vasomotor paresis with all its symptoms, such as cold extremities, clammy skin, slightly depressed bodily temperature and a lowering of the vital capacities; coated tongue; foul breath; loss of the palatal and pharyngeal reflex; stomachic catarrh; depression of sexual vigor; an unsteady gait, amyosthenia, particularly manifest in the legs; forgetfulness, slight degrees of aphasia, usually manifest by the misuse of words and terms, and ordinarily called paraphasia; slowness of mental response, inability to co-ordinate the complex of mental processes, and often a considerable degree of dementia. In acute bromine-poisoning the symptoms may develop so rapidly and be of such severity that they simulate intracranial trouble, such as brain tumor.

The severe manifestations of bromism can be counteracted by the administration of restoratives, cardiac and vasomotor tonics, by drugs that have a special beneficial influence upon the skin, and by the various hydrotherapeutic procedures with which every physician should be familiar. Very frequently a daily dosage of what would otherwise be toxic can by the utilization of these measures be administered without deleterious and disastrous results. The necessity for the continued use of the bromides to combat the frequency of epileptic attacks and also after the fits have ceased is conceded by every one. The intermittent administration of large quantities of bromides is to be deprecated. Nothing can be gained by interrupting the administration of the drug.

This medicine can be administered to best advantage if some definite solution of the salt, such as 25 or 50 per cent. watery solution, be used as a standard. It is impossible to say in grains what the dose of the bromide salt shall be. There is no more a "dosage" accord-

ing to weights and measures than there is of alcohol for a patient with typhoid fever. The dose is the amount the patient can dispose of. For one patient it may be a scruple, for another a drachm: it is necessary to make an individual study of each case. It is as ridiculous to say that the dose of bromide for an epileptic is a scruple four times a day as to say that the dose of morphine in peritonitis is one-fourth of a grain every four hours. No rational person would think of giving the latter directions, and no person who has had anything to do with the treatment of epilepsy would think of giving such instructions. The drugs must be given up to the point of tolerance, up to the completeness of its physiological action, and the patient kept on this if it controls the attacks; if not, toxic effects no severer than absolutely necessary must be produced, and at the same time measures must be taken to prevent toxic manifestations from becoming dominant. After the details have been arranged to the physician's satisfaction, he should study a chart made with the end in view of showing the frequency and time of the attacks; that is, whether they are matitudinal, nocturnal, or periodic, and whether they have any relationship to the occurrence of a periodic function, such as menstruation, whether they are of a petit mal or haut mal character, and whether they are preceded by an aura. If the attacks are always matutinal, the large dose of bromide should be given before the patient arises, and a similar plan should be pursued if the attacks are commonly nocturnal. In those cases in which there seems to be no definite time for the occurrence of the attacks and in patients who are occupied during the day, it has become a kind of custom with me to administer a small dose of bromide in the morning, another during the afternoon, and a comparatively large dose at night. This plan has the advantage that it facilitates sleep, while not producing sufficient stupor to interfere with the patient's waking-time. If, even with this plan of administration of the bromides, satisfactory results do not follow, they should be withdrawn and some other anti-epileptic remedy substituted. I desire to repeat that the desultory and irrational administration of this medicament is worse than no bromide at all. Natural states such as pregnancy are not at all affected by the administration of bromine, nor is the fœtus; and during such states especial care should be taken to prevent the occurrence of attacks.

Seguin has pointed out the advantage to be obtained if the salt is given well diluted and in some alkaline water such as Vichy, and for poor patients water made slightly alkaline by the addition of bicarbonate of sodium. The more liberally the dose of bromide is diluted the better will be its effect.

Abuse of Bromide.—In this connection one word may profitably be devoted to the abuse of bromide. I know of no other drug—with the

exception of those that produce habits, such as morphine and cocaine —that is so enormously outraged as the salts of bromine are. If the truth be told, their therapeutic application is very limited, and the disease under consideration is the only one that justifies their continuous, persistent administration in large doses. The plan which is so frequently pursued of prescribing bromide as a sort of pick-me-up merits the same condemnatory language as that used by temperance advocates against the prescribing of alcohol. It is only necessary to see the colossal mental and physical depravity that sometimes results from the ignorant administration of this drug in minor ailments, and sometimes even in epilepsy, to fully appreciate the truth of this statement.

The most important measure to overcome the severe acne which often attends the administration of the bromides, aside from the maintenance and improvement of nutrition, is some preparation of arsenic, preferably arsenate of sodium; unlike Fowler's solution, this solution rarely deranges the digestion. It should be given in moderately large doses and continued for a short time, one or two weeks, and then intermitted.

If the symptoms of *chronic bromism* become dominant, the patient being pale, with dry, crisp-looking mucous membranes; and is stuporous; forgetful, slow of breath and of heart; depressed; suicidal and emaciated, I have found opium a better stimulant than any other. It would seem to prevent the neural protoplasm from wearing itself out in futile endeavors to overcome the rapid waste of the body and to stay the latter till rest and nutrition can pick them up.

The best all-round vasomotor tonic, stomachic, and general restorative is nux vomica or its alkaloid strychnine, which is generally administered combined with dilute hydrochloric acid. When the toxic effects of the bromide are manifest by inhibition of sexual vigor and of the vesical sphincter, belladonna is often of considerable service to obviate these conditions. Belladonna has in its favor that it of itself is considered no mean anti-epileptic. The most potent aid in the hand of the physician to prevent bromism and its terrible consequences is hydrotherapy. A patient who loses weight and becomes anæmic, has depressed mental and physical vitality, is often started in the opposite direction if instructed to take a tepid or slightly cold plunge-bath in the morning, followed by a vigorous towelling or a spray-bath and blanket pack.

If it is possible, these patients should now and then take a course of treatment in some hydriatric institute, which are now found in nearly every city of any considerable size. They may be substituted, however, to no mean advantage, by the ordinary hose-pipe if sufficient pressure can be obtained, and by the bath-tub and sponge.

Caution should be used in prescribing the cold plunge or cold shower for these patients. Impaired vitality due to the administration of the bromide often prevents them from properly reacting. If for any reason it becomes advisable to materially diminish the dose of bromide which the physician has determined is sufficient to hold the attacks of epilepsy in abeyance, I consider that the plan which is safest above all others is that of putting the patient to bed and keeping him there until the usual dose of bromide can be administered ;—so far superior to all others that I urge its employment in every instance where it is possible.

The most important adjuvant to the use of bromides, in the writer's opinion, is opium. The value of opium in some cases of epilepsy has long been common knowledge, but it was reserved for Flechsig to point out, as he did a few years ago, that opium administered for a short time in enormous doses, then stopped and followed by large doses of bromides, seemed to possess special value. I have given this plan of treatment an extended trial and am an advocate of its application in certain cases. In an article published on this subject about three years ago, I stated it was my opinion that in cases of idiopathic epilepsy which had become very chronic and in cases occurring in early life associated with such somatic and mental shortcomings that defect of the brain was indicated, this mode of treatment had special efficacy. Further experience with it has confirmed my belief. The plan is to administer ordinary pulveris opii or its equivalent of the extract up to 8 or 10 grains daily, the maximum quantity being reached as soon after the beginning of the administration as possible. The patient is kept on this maximum dose for six weeks ; at the end of that time the opium is stopped abruptly and bromide of potassium or sodium to the quantity of 2 drachms daily is given. After a few weeks, varying according to the evidences of bromism produced, the quantity is reduced one-half, and later this can be diminished to 30 or 40 grains, and in some cases even less than this, in twenty-four hours. In my experience the attacks of epilepsy can be materially reduced in this way in almost every case that has shown itself obstinate to the ordinary bromide plan. After a year or two, if the attacks are not cured or kept in abeyance, the opium may be repeated. I have yet to see any detrimental results or sequences of employing this method.

The combination of equal parts of chloral and bromide, which is advocated by Seguin in certain cases, has been put to the test of some personal experience. Its field of usefulness, I believe, is more limited than that of the opium-bromide plan.

Of the other drugs that have been persistently advocated in the treatment of epilepsy by clinicians whose names are synonymous

with integrity, borax and belladonna, and perhaps adonis vernalis, are the most important.

Personally I have had considerable experience with the use of borax in epilepsy, but I have never been able to convince myself that it had any effect upon the disease at all comparable to the bromides. In cases where for some reason the latter cannot be administered it is the best substitute. It should be given in powder or solution, in from 10 to 30 grains three times a day. The only bad effect of such administration is an occasional attack of psoriasis which is easily combated by the administration of arsenic. Belladonna and digitalis and more recently adonis vernalis have been recommended in epilepsy, either alone or in combination with the bromides. One is never justified in administering them alone, at least not with the hope of effecting a cure; very frequently, however, they become important aids, not alone to offset some of the disagreeable accompaniments of bromide administration, but to pick up cardio-vascular tone and aid the system in carrying off the bromides. The tincture of these drugs is generally used, the first two in doses of from 5 to 10 drops and double this quantity of the latter. They may be administered with the bromides. With the exception of borax, perhaps, none of them deserve the name of substitutes for bromide.

A number of other substances—such as simulo, antipyrin, acetanilide, nitro-glycerin, nitrite of amyl, and anti-rabic injection—have been undeservedly praised and hailed as cures for epilepsy. Each of these, with the exception of the first named and the last, has a place in the therapeutics of epilepsy, but only to fulfil some certain definite mission, and to be used symptomatically. For instance, in cases where a distinct vasomotor manifestation precedes an attack in the shape of an aura the administration of nitro-glycerin with the bromides seems to have a particularly beneficial effect, and especially in petit mal attacks.

Measures that have been extensively written of and which I believe are not of the slightest value are hypnotism, hydrastinine, salicylates, duboisine, picrotoxin, cannabis indica, amylene hydrate, osmic acid, sclerotinic acid, and cocculus indicus. It may be difficult to believe that any of these substances has been praised as efficacious, but a review of medical periodicals shows such to be the distressing truth. None of them deserves a trial.

After briefly referring to the various substances that are used in the treatment of epilepsy it is seen that the one substance to which we attach faith is some salt of bromine. The others that have been mentioned with favor are aids to the bromides or substances that can be made use of when the administration of the former is denied.

Moral Suasion in the Treatment of Epilepsy.—Occasionally we meet with patients who are not willing without considerable persuasion, and sometimes even not then, to undergo the bromide plan of treatment, which often involves a considerable suffering and deprivation. To overcome their objection it has only to be shown to them and their parents in a convincing manner that they are afflicted with a disease which without treatment is progressive, and that to a most ignominious end, the pauper or insane asylum, or to the custody of a care-taker if their worldly circumstances allow. If the hope can be extended to them, as the writer believes it can be, that the plan of treatment which is advocated, although it does not often completely cure the disease, very often so far restores the patient to health and freedom from attacks that he is able to discharge the duties of a good social and political citizen, the attending bromism, the mental deviations, and the other symptoms which the long-continued administration of the salts of bromine sometimes produce are nothing comparable to the misery which the possession of a progressive epilepsy entails.

It has often been remarked that new plans of treatment and change of doctors are as beneficial to epileptic patients as change of air and clime are to other invalids. There is truth in this remark, but it is not difficult of explanation. The new physician inquires more closely into the diet, gives more stringent directions as to mode of life, etc., and starts the administration of medicines on a definite plan and the results are better for a time than his predecessor was able to get. But a sort of a personal inventory on the part of the first physician and a review of the details of the administration of the bromides would have secured equally good results. It is this persistent attention to minor points, regularity of eating, bathing, administration of medicine, and all that hospitalization implies, that makes the result of institution treatment better than that of private practice.

Treatment of the Attack.

For the greater number of cases this can be summarized in a line: Place the patient in such a position that he cannot injure himself or destroy anything about him, and await the natural cessation of the attack. It is necessary usually to place something, such as a piece of cork, rubber, or the folded ends of a handkerchief between the teeth to spare the tongue from being bitten when the tonic spasm of the jaw muscles forces the jaws together. If the patient is bound about with clothing in any manner it should be loosened so that respiration and cardiac action may be in no way impeded. It should be borne in mind that attacks are liable to occur at night and that sometimes such patients suffocate themselves, the result of crowding the face into the

pillow, and precautions must be taken to avoid such accidents. When the convulsive part of the attack is over, the patient should be given hot, concentrated liquid nourishment, and efforts should be made to prevent him from going at once into a stuporous sleep from which he awakens after a variable but prolonged time, feeling as though he had received severe corporal castigation and with a confused, exhausted feeling in the head. In some cases it becomes necessary to employ means to cut short the convulsive part of the attack, particularly when there is a tendency for the patient to go into a condition known as *status epilepticus*, where convulsive phenomena succeed one another with great rapidity and often without any intervening period of stupor. In the Hospital for Epileptics, where only the severer forms of epilepsy are kept and where status epilepticus as a clinical manifestation is often seen, I have had the best results from the employment of inhalations of chloroform, given alone or combined with a few inhalations of nitrite of amyl. This procedure is strongly recommended. Occasionally after prolonged *status epilepticus* or after a number of attacks occurring in rapid succession the patient will go into coma. The most useful measures in such a condition are drop-doses of croton oil, if constipation exists, followed by coffee for its stimulant effects, small doses of belladonna and the application of an ice-bag to the head.

Domestic measures, such as causing the patient to swallow a quantity of salt or salt water, a proceding that is often resorted to amongst the unenlightened, are to be frowned at. They cannot possibly do any good. Another procedure which can do no harm, but for the utilization of which time should not be wasted, is the immersion of the patient in hot water, most often employed in the case of young children. The plan of cutting short the attack already mentioned is the rational as well as the efficacious one.

In some cases of epilepsy in which the convulsive phenomena are preceded by a warning, and particularly in those that have a sensory aura passing toward the head from one of the extremities, the attack may be prevented or its severity modified by subjecting the part from which the warning sensation passes to a smart blow or sensory impression. Just how the stimulus works is a problem in the dynamics of physiological psychology that no one has attempted to explain. The warning given to patients is never far removed temporally from the oncoming convulsions, and therefore the sensory insult must be made by the patient. To aid him in doing this it was suggested by Hughlings Jackson that a girdle be worn beneath the sleeve above the wrist, this being the usual starting-point of these auræ, and as soon as the patient felt it coming on to give the girdle a powerful twist, or, if a loop, a tug at the free ends. It is really surprising how often this arrests the

attacks in patients who have this kind of warning, but alas! these are very few compared with the entire number of epileptics. Occasionally the arrest of attacks in this way only robs the epileptic phenomena of the convulsive part, and the vertigo, the stupor, the feeling of profound prostration following it are just as severe as after an ordinary attack. In such a case the patient has little to choose between.

It is not necessary to speak specifically of the treatment of the clinical forms of the epileptic neurosis, and I shall content myself by saying that the same general treatment is applicable in one form of the epileptic neurosis as in another. The treatment of the attack may vary somewhat. In epilepsy procursiva, for instance, and in some manifestations of the epileptic equivalent it is necessary, in order to prevent the patient from doing injury to himself and perhaps to others to restrain him, although he does not appear to be devoid of his faculties. Some sleep seizures usually reckoned as somnambulistic are often of an epileptic nature, and their occurrence calls for stringent measures taken to combat the neurosis. Likewise a considerable proportion of the cases of dual personality are explained by the fact that their one personality is a normal one, the other an epileptic one.

Traumatic and Accidental Epilepsy.

These forms of epilepsy do not necessarily mean that the true epileptic neurosis is present at all, although the *habitus epilepticus* may and does develop if the disease continues for any considerable length of time. The treatment of the traumatic and accidental epilepsies depends very largely upon the origin of the disease. If it be due to trauma that has set up changes of an irritative nature in the cortex of the brain or the tissues in juxtaposition to it, and if it can be localized, the proper and only treatment is to excise it at once. Experience of the last few years has taught that the skull-cavity can be entered, if done with great skill and care, without materially jeopardizing the patient's life. If the lesion that is the cause of the epileptic attacks be found, be it of the calvarium, the meninges, or the cortex, it should be completely excised. It needs to be borne in mind that the danger to the patient is not materially added to by the removal of a generous piece of the cortex in which the lesion is situated or on which it has made pressure. The reason why so many cases of Jacksonian epilepsy fail to be cured by operation is that the operation is not undertaken early enough. If the diagnosis can be made before any considerable amount of change goes on in the brain which forms the anatomical basis of epilepsy, be the lesion in the terminals of the dendritic processes the probable one or be it an increase of neuroglia substance, the chances of success from the operation are

good—much better than some writers are willing to concede. This statement holds true only when the operation is undertaken when the patient has as yet had only a few attacks.

I have under observation now a young man who was operated on two years ago, and a large portion of cortex, which showed striking changes of meningo-encephalitis, removed, who has been absolutely free from any sign of epilepsy ever since immediately after the operation. It is too early to report his case cured, but it seems to me well on toward that end. The diagnosis in this case was made after the second convulsive attack.

The practical point to be remembered about these cases, in addition to what has been said is, that even though the operation has ameliorated or apparently cured the disease, the patient should be kept on moderate doses of bromides for from two to three years after the last fit. When the duration of the case and the character of the attacks puts it beyond the pale of operation, treatment is in nowise dissimilar to that of congenital epilepsy.

The fact needs no mention that the treatment of epilepsy which is symptomatic of new growths, pressure, or any localized lesion, is to remove it and thus get rid of the source of irritation, even if only amelioration is gained by such treatment.

True syphilitic epilepsy—that is the epilepsy of luetic meningo-encephalitis, gummatous infiltration of the meninges, localized syphilitic disease of the blood-vessels and localized cortical gummata—a disease which naturally occurs only after adult age has been reached, and then not so often in the opinion of the writer as some American and foreign authors would have us believe, requires rational and vigorous anti-syphilitic treatment. It is not sufficient to give the mercury alone, that powerful absorbent of newly formed granular tissue, iodide of potassium, must be given also, in very large doses and freely diluted with water. In the administration of mercury the writer has a personal preference for its use by inunctions. If inunctions are properly done it would seem that the patient can be brought more quickly under the curative influence of the drug than in any other way.

Genuine syphilitic epilepsy often assumes the clinical form of Jacksonian epilepsy, and this is a form of symptomatic epilepsy that should not be subjected to operation for the removal of the *materies morbi*, at least not until anti-syphilitic treatment has been tried and found lacking.

The scar-like tissue that is sometimes left after the absorption of granular masses constituting syphiloma by vigorous anti-syphilitic treatment sometimes keeps up symptomatic epilepsy after the real growth has disappeared under medication. There is no reason, if

the surgeon will undertake it, why these scars should not be excised, and if on opening the skull he finds remains of the syphilitic new formation which the anti-luetic treatment has not been able to cope with, they, too, should be removed.

Anterior syphilis produces epilepsy sometimes not by the presence of syphilitic new growths in the meninges and cortex, but by setting up in these parts a degeneration which is now usually called para-syphilitic, and which is comparable to the lesions of tabes and general paresis—syphilitic in origin, but not syphilitic, or at least not characteristically so, in nature. The treatment of this form of epilepsy with anti-syphilitic measures is useless, if not worse than useless. If it be granted that after death these cases do not reveal lesions that can in any way be considered syphilitic it is hard to suggest a reason why they should be subject to anti-syphilitic treatment. The treatment that these cases require, and the one that is most serviceable, is the combined tonic and bromide plan, the nutrition of the patient being kept up to the highest possible point all the time. These cases do not tolerate anything like the quantities of bromide that a case of congenital epilepsy does and it is necessary to be on the careful look-out for toxic symptoms of this drug, for it is in these that sad results from careless administration of bromide is often seen. The general dietetic, hygienic, disciplinary treatment of this form of epilepsy does not differ from that of the form first considered.

I believe that I have already said sufficient in answer to the question, What can we expect from the surgical treatment of epilepsy? in the remarks on the treatment of traumatic epilepsy. But let me summarize the matter in a few words:

The present generation of physicians has witnessed the most remarkable advances of surgery that have ever been made. This may in a way account for the furor for operating on all sorts and conditions of epilepsy that seemed to take hold of surgeons the civilized world over a few years ago. If it does not, we are unable to suggest the answer. That such a furor existed no one who examines the literature can doubt. The result of this experience would seem to be that, to-day, operation on the skull, trepanation of the skull, incision of the membranes and the removal of cortex, is only justifiable under the conditions already mentioned. Absolutely nothing is to be gained by subjecting any other types of epilepsy to operation.

It has often been noticed that in almost every case after operation there is a temporary cessation, of greater or less duration, of fits. This has been attributed to the effects of the operation *per se*, and it has been pointed out that a corresponding respite follows any operation, it matters not on what part of the body it is made. I am inclined to believe that the operation *per se* has very little to do with

diminution of frequency of the fits, but that it is due to hospitalization, limited, selected diet, careful nursing, the discipline of regularity, increased amount of sleep, etc.

The treatment of epilepsy that develops for the first time in later life, epilepsia tardia, is a different matter from the treatment of primary idiopathic epilepsy. In the majority of cases this form of epilepsy is an expression of some diathetic condition anterior to the epileptic attacks, and it is necessary to continually combat this while treatment is being directed to the symptom epilepsy alone. The real anti-epileptic agent in these cases as in the others is bromide. Its beneficial effects are often materially increased if combined with nitro-glycerin.

The general treatment of these cases differs in a way from that suggested for the parasyphilitic variety. The danger of the *status epilepticus* is particularly great, and there should be no hesitation in attempting to cut it short with chloroform and nitrite-of-amyl inhalations.

The treatment of parents, guardians, and care-takers of epileptic patients is oftentimes quite as important a feature as the treatment of the patient himself. The necessity of deputizing the entire administration of medicine, as well as scrutiny of the diet, to some intelligent person who has the interest of the patient at heart is very urgent. It is wise to impress upon parents from the beginning of treatment the nature and probable outcome of the disease and the necessity for treatment as detailed and careful as that for typhoid fever. To carry it out without becoming discouraged, especially when in the beginning no great progress is made with the disease, is often very trying, and such parents require diplomatic handling more for the sake of the patient than themselves. All in all, the institution plan of treatment for epileptics from the lower walks of life is best. For those whose providential position allows them to carry out the pedagogic, disciplinary, and therapeutic plan above detailed, this method offers all that science can offer for this unfortunate class, and it must be said it offers more than one usually infers from reading text-books on the subject. The treatment of epilepsy in reality is not the cultivation of a barren acre. Personally, I know of no organic disease of the nervous system of comparable chronicity and severity in which the results of treatment, intelligently carried out, are better.

HYSTERIA.

THE treatment of hysteria requires more tact, perseverance, and industry than any disease in the domain of neurology. I shall consider the subject under three headings: 1. The prophylactic treatment;

2. Treatment of the neurosis (or psychosis, more properly called);
3. Treatment of an attack, and of individual manifestations.

The nature and genesis of hysteria cannot be discussed to any extent here. It seems to be universally conceded that hysteria is a nervous disease, using the term in that broad sense to include all of the psychoses in which a dynamic perversion of neural energy constitutes the basis of the innumerable symptoms. The ancient conception of the disease made it an attribute of the reproductive organs and restricted its occurrence to the female; a more modern one looked upon it as a shortcoming, and reckoned it in the category of conceit, affectation, and other attributes of puerility and of defective evolution; but the most modern view, the one that we have mentioned, associates its genesis with distinct neuropathic heritage as a predisposing cause, and psychical trauma, and all things contributing to it, as its most important exciting factor.

Hysteria, in other than its minor forms, which are not infrequently seen manifest in literature, art, and politics as well as in the consulting-room, is relatively uncommon in this country. In the Latin countries and their territorial environment, such as Austria and Switzerland, it is a very common disease.

Like all degenerative neuroses and psychoses, its treatment should be begun before the birth of the child who is heir to it. It cannot be too strongly urged upon physicians who have the care of families that the direction of an hysterical woman's pregnancy should be with the end in view to bring forth a child with a stable nervous organization, as well as a successful accouchement. This can in a measure be contributed to by studiously arranging her environment so that everything that contributes to mental equanimity and self-restraint is in evidence. All things conducive to the opposite are to be avoided.

The children of hysterical mothers should be removed from the tutelage and espionage of the latter as soon after the actual formative stage of the child's real character, from the sixth to the tenth year, as possible. Such a plan contributes not alone to the welfare of one, but is beneficial to both.

The education of children of hysterical parentage calls for nearly the same amount of intelligent collusion between the physician and the pedagogue as does that of defective children. The details of such treatment must suggest themselves to every intelligent family physician. All manifestations of precociousness are to be discouraged, childish coquetry and self-indulgence is to be exterminated, and the epochal period of menstruation and maturity is to be jealously guarded. The trend of modern civilization in this country, happily, is toward the development of the body, the cultivation of out-door

sports and plenty of refreshing sleep for children; these are inimical to the development of hysteria. Inculcation of the precepts of self-control, generous feeling, altruistic sentiments, and intolerance of mawkish sympathy does much to prevent hysterical tendencies. The psychical trauma which starts the dynamic defects of hysteria into existence are often traced to terrorizing tales of the nursery, to sentimental *affaires de cœur* which the *fin de siècle* girl is often permitted to take seriously, to the assumptiom of marital obligations by persons totally unfit, and to abnormal indulgences such as *coitus reservatus*, etc.

The general treatment of the profound neurosis hysteria is not easily disposed of in a few paragraphs, so varied are the physical, social, and mental conditions which have to be contended with. Very often the measures to overcome the collective manifestations that constitute the state hysteria must be applied hand in hand with those taken for the relief of some particular symptom, such as contracture, paralysis, or blunting and obscuration of some special sense; so although I shall have to speak of these measures separately the truth of this statement should be borne in mind.

The first most important step in the treatment of an hysterical patient is for the physician to put himself entirely *en rapport* with the patient and family of the patient—that is, secure the confidence of the former and the co-operation of the latter. In the severer forms of the disease, a most important disciplinary and hygienic measure is complete or relative isolation, a plan which all concerned are apt to look upon as an unnecessary cruelty directed against one who has been able to exist only because of the tender care and continous sympathy that has been lavished upon him or her. Even in the milder forms of hysteria, and by this we mean any hysterical manifestation short of *grand hystérie* and the clinical conditions unfortunately called hystero-epilepsy and hystero-catalepsy, it often becomes absolutely necessary to separate the patient from her previous social and family environment, not only to overcome the comparatively mild manifestations of the disease, but to prevent it from getting a firm claim upon the patient. In many cases uncontrollable exigencies will necessitate that partial isolation be carried out in the patient's home or in a hospital, but whenever feasible it is best accomplished away from home in a sanatorium or house directly under the physician's medical supervision, and in every instance it should at least be so complete that the patient comes in contact only with strangers.

Anything that tends to lower the patient's nutrition and vitality is conducive to hysterical manifestations. These accidents are to be guarded against, and when they occur they must be amended as soon and as thoroughly as possible. The helpful measures to attain this

end, aside from regulation of the digestive organs and scrutiny of the diet, are hydriatric procedures, massage, exercise, and electricity. When whole volumes are devoted to hydrotherapeutics it is easily seen how difficult it is to convey a just appreciation of its merits in a few lines. In a general way, however, it may be said that for all hysterical phenomena, with the exception of spasms, cold water, in the shape of douches, sprays, plunge, wet pack and drip-sheet, is the serviceable form. Its use is intended to serve two purposes: tonic and sedative. The tonic effects are obtained principally by the use of the douche, the one essential physical element of which is pressure, directed particularly to the spine and to the solar plexus; by the plunge, which gives a profound shock and is followed by a reaction and beneficial metabolic changes; and by the spray or needle bath, the beneficial effects of which are on the peripheral nerves, vasomotor, sensory, and motor. For the many details of the practical applications of hydrotherapy the reader is referred to special works on that subject. I do not mean to convey the impression that in order to get all the benefit to be had from these procedures it is necessary to have any elaborate apparatus. All that is really needed is a tub, a piece of hose-pipe with a detachable spray, if the requisite pressure can be obtained, and a pitcher. If it is decided after trial and careful consideration of the patient's tolerance, *i. e.* the reaction and after-effects, that the most beneficial impress can be made upon the *morale* and nutrition by means of the douche, its application will have to be guided largely by individual idiosyncrasies of the patient. In some instances reaction will be accompanied by frontal headache and excessive lassitude, cold extremities, etc. In such cases these can usually be avoided by having the patient's head enclosed in a towel rung out of iced water, and by having the douche of from 50° to 70° F. applied for one to three minutes' duration while the patient stands in warm water. Cold water can often be utilized to great advantage by the use of drip sheet, particularly if the patient is sleepless, applied just before retiring.

When the spray or needle bath is used it should be borne in mind that this is one of the most potent ways of dissipating bodily heat, and the precaution taken of applying it for not more than a few seconds and of seeing that becoming reaction follows its application. The cold plunge-bath, when the patient's circulation will allow of its use, is one of the best general tonics, particularly if the patient remains in the water for only a few moments, and during that time active friction is kept up either by an attendant or the patient himself, and after the bath vigorous towelling or percussion. If the plunge is too great a shock, patients can often be educated to it by beginning with a temperature of 80° to 90° F. and each day making

it five degrees less, until finally it can be taken at the temperature of the room—that is, of a bath that has been drawn for considerable time.

The technique of hydrotherapy is best gained by experience, and whenever feasible the physician should avail himself of a properly equipped hydriatric institution. Its application will be most satisfactory, however, when the physician gives personal supervision.

The form of electricity that is most useful in combating the asthenic state of an hysterical patient is also often best decided after trial. Usually it is either faradic or static electricity. The latter is often frowned at nowadays, as it plays such a conspicuous part in the armamentarium of the charlatan, but it must be admitted that it frequently has not alone a commendable moral effect but acts as a powerful tonic to the muscular and nervous systems as well. In fact its action is not unlike that of another therapeutic procedure which has come much into vogue in our day, rapidly repeated and multiple percussion advocated by Granville. This form of electric energy has the same characteristics as faradic, viz. high tension and slight quantity, and often has quite as good effects in hysteria. It is not so applicable to erethitic and painful states as is faradic electricity of the long coil and rapid vibration.

I am not able to speak of the efficaciousness of the electric bath and electric douche from the standpoint of any considerable experience, but what I have seen of these procedures abroad has not greatly prejudiced me in their favor.

In some instances where hyperæsthesia or anæsthesia are not being specifically combated and where electricity is applied for its general tonic effects, general faradization is one of the most satisfactory ways of using this agent. Massage, Swedish movements, calisthenics, and various forms of parlor gymnastics are often efficaciously employed to combat certain manifestations of asthenia and to increase muscular tone while the patient is undergoing house-treatment. The various forms of exercise such as golfing, bicycling, climbing, and the like—which are so often serviceable not only to improve the patients' general condition but to teach them self-reliance and make them less indulgent and introspective—all may be made to play a very important part to prevent hysterical paroxysms or to assist in recovering from them. Although the life of an hysterical patient should be one of physical activity, in some cases it is necessary in the beginning to follow a plan of treatment known as the rest cure, as proposed and carried to such a point of efficacy by Mitchell, or a modification of it. I hesitate, however, to use the label "rest cure," for it has been my experience that a rest cure labelled and carried out in the perfunctory way in which a series of massage movements are carried

out—that is, without the greatest circumspection and variation of detail for every patient—is about as hazardous a formulated draft of rules as can be put into the hands of an inexperienced and injudicious physician. I have therefore thought it wiser to discuss the various details and allow the reader to label them as he likes.

The regulation of the various functions of the body, such as that of the bowels, the kidneys, the reproductive organs, etc., I do not understand to require explicit directions here, more than to say that careful consideration of them will be rewarded in this disease, as it is in all others where there is a dissociation of the production and expenditure of energy. Restoratives such as iron and cod-liver oil, appetizers such as the simple bitters, and occasionally sedatives, particularly those acting on the sympathetic nervous system, all have an important place in the therapy of hysteria.

Treatment of Individual and Associate Manifestations of Hysteria.

The most common individual and associate manifestations of hysteria are hysterical paroxysms or convulsions (which may vary from slight perversion of emotional display up to the most violent and alarming state of clonic and tonic convulsions associated with the most repulsive and gruesome distortions and condition of spasm the continuance of which is inimical to life); contractures; paralyses; blindness; deafness; trophic troubles such as œdema and atrophy; anorexia; vomiting; mutism; pseudo-angina; colic; clavus and rachialgia, and so on almost to the end of all the diseases that are accompanied by suffering, deformity, or outward manifestation.

It is with the treatment of the spasmodic and convulsive phenomena that we are particularly concerned, although we cannot consider these without referring to other accompaniments, for many of them (known as "stigmata") are the constant and pathognomonic attendants of hysteria.

In the treatment of the spasmodic accompaniments of hysteria the first point that I wish to impress is that there is rarely any need of great haste. I say this on account of the fact that the most common proceeding for the physician when called to a patient in the apparently agonizing condition of a hysterical paroxysm is to conciliate the family by cutting it short with a hypodermic injection of morphine—as baneful and ill-advised an action as can be easily imagined, and one that should scarcely if ever be resorted to. The first thing to be done is to dispense with the aid of sympathizers, busybodies, and other unnecessary elements of the gathering which is sure to be about the patient. The physician owes it to himself to assure the family that he stands between the patient and danger and that although the attack

may last for some time the eventual outcome will be satisfactory. The patient should be placed so that she cannot hurt herself or do violence to things or persons about her, and, if there be any necessity, no hesitation should be had in the use of artificial measures of restraint such as the "captive" sheet or a strait-jacket. If there be any danger of asphyxiation the patient should be given a few whiffs of chloroform, and this measure is always to be preferred to morphine. Sometimes by aid of this the patient can be transferred from an hysterical, convulsed condition, particularly when aided by suggestion, into one of quiet somnambulism. And in all cases when the condition of the patient will allow of it an endeavor should be made to quiet and assure the patient by suggestion and so carry her into a somnambulistic condition. Very often when the patients are in a state of apparent or complete unconsciousness they can be sufficiently aroused by pressing on hysterogenetic zones to allow them to become amenable to suggestion. In some cases, and particularly in those in which the physician has reason to believe that severity of symptoms is being in part simulated, putting the patient abruptly into a cold bath has the most salutary results. The value of prolonged warm baths in hysterical convulsions, as in all other convulsive conditions, has been greatly overestimated, and resort to it generally represents time wasted. The administration of foul-smelling, pungent medicines such as the valerianate of zinc, tincture of valerian, asafœtida, etc., is the legacy of a barbarous pharmacology; they are of very slight service.

I have sometimes thought that a capsule containing valerian and compound spirits of ether had some influence in warding off an attack if the patient took it when she believed she had premonitions of an attack, but I am willing to believe that it acts, not by virtue of the drugs, but by suggestion. I have, however, seen a dose of apomorphine clear up a hysterical paroxysm with great celerity.

There are very few if any cases that do not submit to the procedures that we have mentioned. The treatment after an attack is that already detailed directed against the general neurosis.

Here it is fitting to say a word anent the surgical procedures, particularly on the generative organs, that have been proposed for hysteria. They are particularly the removal of normal ovaries (oöphorectomy so-called), hysterectomy, clitoridectomy, and castration in the male. I do not mention operation on the coccyx, on the vagina, etc., because these are of comparative insignificance when compared with the others. It should be repeated that no one can be more solicitous that all parts of the body should be carefully examined and restored to conditions of normal functioning than the writer, and if it requires a galaxy of specialists or a general practitioner to do this,

their services should be enlisted, so that the object may be attained. After saying this, however, I deem it fitting to say that the same punishment should be meted out to the man who wilfully removes a normal uterus, ovary, or testicle, or one not so far diseased that it cannot be nursed back to a normal condition, as is judicially given to him who premeditatedly takes deliberate aim and maims with weapon of any sort a fellow creature. In the light of a comprehensive knowledge of the reports of "cases of hysteria and hystero-epilepsy cured by surgical procedure upon the generative organs," I say that I refuse to believe that one example of the neurosis hysteria has ever been cured by such barbarous, unscientific, unrighteous measures.

The place which hypnotism holds in the therapy of hysteria has always been and will probably always remain a very insignificant one, using the term hypnotism in the only sense in which the majority of the profession, in common with the laity, will use it, viz. that of carrying a person into some degree of unconsciousness by means of impressions made on some one or all of the special senses. I believe that suggestion, whether by word of mouth, by precept, or by ocular demonstration, may often be used most beneficently, and if these be reckoned hypnotic procedures they have a legitimate place in the therapy of this neurosis. But to abuse them, or to surround them with any air of mysticism, or to flaunt them as an unusual, or individual, possession is to place one's self on the same plane with the charlatan or the negro hoodoo. It is far better to avoid the use of hypnotism entirely as a definite procedure than to abuse it by borrowing the airs of a professional hypnotist.

The treatment of the various stigmata of hysteria is the treatment of the neurosis itself; only a few of them deserve special mention. The proceeding known as metallo-therapy may have some slight efficacy in dissipating hysterical anæsthesia, and may be made use of to the extent of laying on pieces of magnetized iron or simple strips of copper, but to speak of their beneficial effects when administered internally is to confess an entire ignorance of the rationale of their occasional effectiveness. Hysterical anorexia is often a most obstinate symptom to overcome, and all the paraphernalia of general and local treatment must be brought to bear on it. Forced feeding should be left to the last.

Hysterical contractures are usually amenable to massage and faradic electricity. The application of the latter by means of the faradic brush is often most efficacious in overcoming anæsthesia. Occasionally to overcome the contractures the aid of complete etherization or chloroformization must often be espoused, and the co-operation of the orthopædic surgeon, with his splints and braces, enlisted.

OCCUPATION SPASMS AND CRAMPS.

A SPASMODIC or cramp-like condition in individual muscles or groups of muscles that act together in the performance of certain acts of co-ordination such as writing, telegraphing, piano-playing, and similar occupations, and which completely incapacitates the possessor from further indulgence in such occupation, is a condition which the physician is frequently called upon to treat, and one which often taxes his skill, patience, and ingenuity. The number of these occupation "cramps" becomes greater every year in proportion as human inventiveness devises new sports or labor requiring complex co-ordinated muscular activities.

The most common of these affections at the present time are those just mentioned, to which may be added similar conditions occurring in milkers, golfers, cigarette-rollers, smiths, ballet-dancers, etc.

Writer's cramp (graphospasm, or mogigraphia) is the most frequent of these, or at least has been until latterly, when the extensive use of the typewriter is replacing the scrivener. It is the most obstinate to overcome, and it may be taken as a type of this class of disorder.

For a long time occupation-cramps were considered to be an expression of fatigue and exhaustion of peripheral parts, of the structures in which the spasm is manifest. This view is held by none except venders of apparatus to cure writer's cramp at the present day, and the symptoms are looked upon as an expression of a constitutional neurosis called into activity by some persistent and fatiguing labor. Such a neurosis has no individual anatomical seat, except the collective motor and sensory neurons be so considered. Its occurrence in neuropathic individuals and in those who manifest some evidence of nervous instability, such as neurasthenia, migraine, tic, neuralgia, or even organic nervous disease, is evidence that the condition is a constitutional one with a local place of display which occurs under the auspices of exhaustion. The treatment of the occupation-spasms can only be successful when this conception of their genesis is heeded and the plan of treatment based upon it. The local treatment of such a condition as writer's or telegrapher's cramp alone is never sufficient, no more than the local treatment alone of profound neurasthenia associated with enlarged prostate in a young man addicted to sexual excesses and irregularities would be considered sufficient.

The most essential feature in the treatment of these affections is cessation of the occupation which is the cause of its occurrence. Much may be done to prevent writer's cramp by the intelligent observation and care of teachers in correcting faulty methods of holding pen and pencil while the child is learning to write. More rapid and satisfactory progress is made with these cases if insistence on this is

required from the start. Very frequently the relinquishing of occupation means cessation of one's livelihood, but it is far better to do this at a time when the patient has the capacity to turn to something else than to consume time which may be made valuable to him by treatment in the utilization of such makeshifts as writing with the left hand, employment of apparatus for writer's cramp, etc. Naturally, if the physician is consulted early he may counsel the use of large penholders or some apparatus, such as Nussbaum's bracelet, or that of Wolfe or of Anderson, that prevents the muscles from getting into such a state of contraction that cramp occurs, the use of the typewriter, etc.; and if at the same time active measures can be taken in the way of hydrotherapy, exercise, massage, electricity, tonics for the restoration of the general health, it may not be necessary to completely give over his occupation. Time will be saved, however, in every instance by so doing. When the patient has ceased or materially modified the occupation that causes the spasm he should be put through a restorative plan of treatment not unlike that employed for other neuroses, such as neurasthenia and hysteria, the object being to improve the nutrition, increase the bodily weight, secure refreshing sleep, develop muscular strength, and restore the equilibrium between production and expenditure of nervous energy.

Treatment directed toward the relief of the spasm should consist in enveloping the hand and forearm in a wet, cold pack once or twice a day, the use of a mild galvanic current directed through the brachial plexus, the positive pole over the latter, the negative at the back of the neck, for fifteen to twenty minutes each day, the administration of sedatives such as hyoscyamus, belladonna, chloral, and the valerianates, and by the hypodermic use of strychnine in large doses, $\frac{1}{30}$ to $\frac{1}{15}$ of a grain once or twice a day directly into the tissues where the spasm is manifest. This last measure is usually not required, but when the others fail to secure the desired benefit there should be no hesitation in using it.

Coincidently with the utilization of measures taken to better the general nutrition, local gymnastics, massage, etc., should be employed to strengthen the parts which are, or were, the seat of the cramp. For this purpose massages and resistant exercises of the individual fingers and muscles of the hand and forearm should be practised most persistently. These measures are by far the most important in conjunction with the general treatment, in restoring the patient to health.

A return to the occupation which excited the spasm should be delayed as long as possible, and at the slightest indication of a return of the condition it should at once be relinquished. The treatment of the various other forms of occupation-spasms differs in no wise

from that already detailed except as influenced by the parts of the body in which they occur.

There are a number of spasmodic conditions, some of them analogous to the spasmodic tics on the one hand and the occupation neuroses on the other. They are masticatory spasm, nodding spasm or spasmus nutans, spasm of the tongue or aphthongia. Other spasmodic conditions, such as phantom tumor, rectal spasm, œsophageal spasm, etc., are purely hysterical. Spasmodic wry neck and facial spasm are considered as tic of the nuchal and facial muscles respectively.

The treatment of some of these conditions requires individual mention, such as spasmus nutans of infants, a condition which occurs very largely in rachitic children. The movements usually disappear after the patient is given thorough treatment with iron, preferably the iodide or mistura ferri et ammonio acetatis, hypophosphites, and cod-liver oil.

Masticatory spasm, if other than acute (which is sometimes excited by a chill, when it can be relieved by warm applications), requires the same treatment as facial tic, of which it forms a part.

The spasms which have been enumerated above and which are dependent upon the neurosis hysteria do not require treatment different from other hysterical manifestations. For their temporary relief I know of nothing that is more reliable than a mixture of belladonna and bromide of potassium, the former given up to its physiological effects. Other anti-spasmodics, such as valerian, asafœtida, chloral, etc., may be administered, but they are rarely necessary.

THE DRUG HABITS.

By F. X. DERCUM, M. D.

Drug habits present so many complex questions that it is necessary to consider briefly their nature and etiology before attempting to discuss their treatment. Roughly speaking they occur by preference in three groups of individuals: first, in those in whom there is a neurasthenia either hereditary or acquired; secondly, in those in whom a habit has followed the prolonged use of a narcotic or sedative prescribed for some illness; and, thirdly, in those in whom a habit has been acquired incidentally to social life. The first class is separable, as indicated, into—first, those in whom the habit is associated with hereditary or congenital neurasthenia; and, secondly, those in whom the habit is associated with acquired neurasthenia.

It has long been known—indeed, it is a matter of lay experience—that some of these habits, especially alcoholism, are hereditary, and pass sometimes uninterruptedly from generation to generation. It behooves us, therefore, to consider, first, as far as may be done, the characteristics of the constitution in which hereditary inebriety occurs. As a rule, there is a more or less pronounced family history of neurasthenia, of headaches, and other functional nervous troubles. In addition a neuropathic element may be present; thus it sometimes happens that in the same family in which hereditary inebriety occurs there are also instances of the insane neurosis, of marked eccentricity of character, or of excessive precocity or genius running hand in hand with imbecility and idiocy. In cases presenting such a history, treatment, it is needless to say, is very unpromising. In cases in which the family history suggests merely an hereditary neurasthenia the outlook is somewhat better, provided measures can be instituted controlling the manner of living, occupation, and other factors involving the degree of nervous strain to which the individual is subjected.

In cases belonging to the second subdivision of the first named group—those, in which the drug habit occurs as a result of acquired neurasthenia—the problem of treatment is an essentially different one, and decidedly more hopeful. Here, evidently, the treatment is to be directed to the underlying nervous exhaustion. Again, in considering cases in which the drug habit is acquired as the result of the

long-continued use of a drug or stimulant prescribed medically, we should remember that persons of a normal nervous organization are not likely to form pernicious habits under even these circumstances, and if such a habit be formed the suspicion is justified that an hereditary neurasthenia or a neuropathic factor is at work. Thus, if after the treatment of a case of typhoid fever it is found that the patient has acquired the alcoholic habit, we should inquire as to a family history of inebriety or of various functional nervous troubles suggesting neurasthenia or neuropathic conditions. To strictly normal individuals, the use of stimulants—and we speak in this connection especially of alcohol—beyond the limits prescribed by ordinary social usage, is unpleasant and distasteful; and even when as the result of special social occasions alcohol is taken to excess by such persons, a disgust for the drug ensues which leads to a period of relative abstinence. In neurasthenic and especially in neuropathic individuals, the after-depression from the excessive use of stimulants is so great, and is accompanied by so much psychic pain and physical suffering, that a craving for the drug ensues.

Inebriates, especially alcoholics, are also separable into two classes as follows: first, those in which the drug or stimulant is used habitually, day after day—of this class the so-called moderate drinker is typical; secondly, those in which the stimulant is taken at regularly or irregularly recurring periods, the intervals between the attacks being characterized by more or less complete abstinence. In such persons an attack may be provoked by unusual nervous overstrain, or may recur at certain physiological periods such as the menstrual epoch. Again, it may be provoked by the use of a stimulant socially or in accordance with medical advice. To this class especially belongs the periodic inebriate, the one who goes "on sprees."

The above remarks, while they apply in part to other drugs, apply especially to alcohol. Other drug habits, it may be here stated, present peculiarities of their own. At the same time, the general statements applicable to alcoholism apply in a great measure to them. It would seem proper, therefore, to give to alcoholism our first attention.

ACUTE ALCOHOLISM.

Alcoholism occurs in two primary forms: (1) Acute alcoholism; (2) Chronic alcoholism. Chronic alcoholism occurs, as we have just seen, in the continued and the periodic forms.

We will consider, first, acute alcoholism. Acute alcoholism varies from conditions in which there are present transient exaltation or

delirium to those in which there is present profound coma, and, if the excess be repeated for several days in succession, a condition at last ensues characterized by acute and violent delirium and grave signs of exhaustion, the so-called *mania a potu* or delirium tremens.

With the attack of acute alcoholic intoxication we have, in the consideration of drug habits, really little to do. A few words, however, as to the management of such an attack may not be out of place. If there is reason to believe that there are still large quantities of unabsorbed alcohol in the stomach, free vomiting should be induced, either by the administration of copious draughts of warm water, of mustard, or of other remedies by means of which the stomach may be readily evacuated. Subsequently, or even without the previous administration of an emetic, it may be of advantage to administer a brisk cathartic, and to this end a saline purge such as a full dose of Epsom salts is frequently efficacious. At times it is better to administer a pill of blue mass or calomel, before giving the salts.

If a Turkish bath be available this measure may also be instituted. The Turkish bath stimulates the skin to such a degree that the poison is rapidly eliminated, and probably it also stimulates the elimination of the drug by the lungs. It is not an uncommon experience with some men to become intoxicated at a dinner and then after repairing to a Turkish bath emerge at the end of an hour or more almost if not completely sober. If the Turkish bath be not available a full hot bath in an ordinary tub is often efficacious.

Measures should also be instituted for averting the post-alcoholic headache, which in many cases is often of great severity. It is well, therefore, after having given a Turkish or hot bath, before allowing the patient to rest or go to bed, to administer a full dose of one of the bromides, say a drachm. This remedy is so efficacious, indeed, that in many cases in which the bath is not available, the bromide itself permits the patient to awaken the following morning with little or no cephalic distress. The effect of the bromides is much increased by combination with a dose of antipyrin. Caffeine also is useful. Various combinations of the bromides with caffeine are sold in the form of effervescing draughts by druggists.

Treatment of Delirium Tremens.

If the alcoholic debauch has been sufficiently prolonged and sufficiently deep, the condition known as delirium tremens or *mania a potu* supervenes. Measures should at once be instituted, such as are indicated in ordinary delirium when associated with profound exhaustion. Almost always a certain amount of physical restraint becomes necessary, and this is best accomplished by fastening the patient in

bed by means of sheets drawn firmly over his body or over his limbs, but in so doing we should be careful not to impede respiration. Often it is necessary to put leather gauntlets on the wrists and ankles.

As in other asthenic states, a treatment should be adopted the aim of which is to support the strength of the patient. Milk, eggs, beef-tea, beef-peptonoids, and other beef preparations should be employed. These should be given in as large quantities as it is possible to administer, and at short intervals, say of one or two hours. At the same time strychnine and digitalis should also be given, the former in doses from $\frac{1}{40}$ to $\frac{1}{20}$ of a grain every four hours. It should be administered hypodermically. Some judgment is, however, necessary in this respect, inasmuch as the insertion of the syringe frequently increases the terror of the patient and enhances his hallucinatory delusions. Digitalis should be given in from 8 to 15 or 20 drops at a like interval (four hours), the dose being guided by the condition of the pulse.

Whether alcohol should be administered in a given case is a matter requiring careful consideration. As a rule it is necessary to give a certain amount of alcohol; sometimes it must be given very freely. It will be found, however, that in many cases in which forced feeding is practised, and in which full doses of strychnine and digitalis are being administered, the alcohol can be limited to relatively small quantities. However, when in spite of other measures the pulse fails and becomes very frequent and weak, and the skin becomes cold and clammy, alcohol must be given in full doses.

In the majority of cases the physician is also compelled to resort to various sedatives in order to induce sleep. It is the habit of the writer to prescribe a combination of bromide, morphine, and chloral. As a rule such a combination is very efficacious. It should contain a maximum amount of bromide and but moderate amounts of chloral and morphine. The bromide, which should preferably be in the form of bromide of ammonium, should be administered in 1-drachm doses, while the chloral should be given in doses of but 10 or 15 grains and the morphine in doses of $\frac{1}{4}$ of a grain. It is found, as a matter of experience, that in these patients sleep is induced with the greatest difficulty, especially in the beginning of the attack, and it is also well to bear in mind that hypnotics are capable of doing harm as well as good, and the doses should therefore not be too frequently repeated. Sometimes, however, it is absolutely necessary to increase the dose of morphine. At other times the extract of opium is advantageously substituted. Frequently, also, instead of pushing the mixture of bromide, chloral, and morphine just mentioned the writer makes use, in addition, of moderate doses of trional, say 10 to 20 grains. Hyoscine hydrobromate, gr. $\frac{1}{100}$ to $\frac{1}{50}$, may also be used, though in the hands of the writer it has not in this class of cases given much satis-

faction. We should remember that if sleep be very difficult to induce, it is far better to tide over the restlessness by moderate doses of hypnotics than to push these excessively, especially as in the majority of cases sleep is quite readily induced on the second and almost always on the third or fourth day. As a rule, also, in cases that are properly fed and in whom strychnine and digitalis are used judiciously, sleep intervenes without the excessive use of the narcotics. Sleep having been once established, it is a small matter to keep up feeding and sleep until the attack has passed away.

Not infrequently delirium tremens is complicated by pneumonia, and then the patient's condition is indeed serious. In such cases the supporting measures already discussed are doubly indicated. De Tours very properly points out that in this state opiates should be given in small doses, while alcohol should be given in abundance.

CHRONIC ALCOHOLISM.

In chronic alcoholism, the fact of an underlying neurasthenic or of a more serious neuropathic element is usually so evident that one is surprised to find how little it is taken into account in the various special methods of treatment in vogue. We find, it is true, that during withdrawal, tonics by the mouth and various drugs, such as strychnine and atropine, hypodermically are recommended, but no real attention is paid to the underlying nervous disorder itself. The importance of taking this factor into account and the success so frequently attendant upon such a plan will be presently pointed out.

Prognosis.—Before a plan of treatment is instituted we are invariably asked to give a prognosis, and into this, as has already been shown, various elements enter. Everything depends upon the family and personal history, and especially the manner in which the habit was formed. Thus the prognosis is most favorable, other things being equal, in cases in which there is a history pointing to an acquired neurasthenia; it is less favorable if the facts point to an hereditary or congenital neurasthenia; it is still less favorable if neuropathic features such as have been already dwelt upon are present, and is almost hopeless if, in addition, a history of confirmed hereditary inebriety is present. Further, other things equal, the prognosis is most favorable in cases in which the habit has been formed as a result of social drinking, less favorable in those in which it has resulted from, or been incidental to, some severe illness, and least favorable in cases in which it has arisen spontaneously in the form of solitary drinking.

Having determined as far as possible the etiology of a given case

of alcoholism and the degree in which neurasthenia or neuropathic features are present, it becomes necessary to study the physical condition of the patient to determine the presence or absence of organic visceral disease. To this end the liver should be carefully studied, bearing in mind of course the relation of alcoholism to cirrhosis. The heart and blood-vessels should be examined, bearing in mind fatty and atheromatous changes. Similarly careful studies of the urine should be made with a view to detecting chronic renal disease. The lungs also should receive a due share of attention; it is unnecessary to point out the significance of possible changes in these structures save to mention the not infrequent coexistence of phthisis and alcoholism, and the further fact that many confined alcoholics suffer from chronic bronchitis. The digestive tract demands a very large share of our attention. Almost invariably there is present a marked chronic gastritis which above all things must be taken into consideration in the scientific treatment of the disease.

Treatment.

Having carefully studied our patient, the first problem that presents itself is the question of withdrawal of the drug. While opinions differ, it is in the writer's experience always best to attempt rapid or immediate withdrawal. If no recent exacerbation has occurred, this can as a rule be accomplished without much difficulty; if, however, the patient is just passing through an alcoholic attack or has recently committed more than the usual excesses, the withdrawal will have to be more gradual. The moral effect of a too gradual or too prolonged withdrawal is bad, and, as already stated, a withdrawal as rapid as is consistent with safety should be instituted. We should be guided largely by the nervous symptoms and by the action of the heart. Collapse, mental confusion, delirium, and excessive prostration of course demand a very gradual withdrawal. Whenever possible the alcohol should be given with food.

Having decided the question as to the rate of withdrawal, it now becomes necessary to lay out a plan of treatment. Drugs, so much dwelt upon by others, are assigned a secondary value by the writer. In his judgment, natural therapeutic measures are far more important and lead to far more satisfactory and durable results. As we shall see, they are readily applicable to the underlying nervous disorders so commonly present in these cases. Drugs may, however, be used at the same time with advantage. But their employment depends upon each individual case. No routine method of their application, no one drug, no one formula can be considered as applicable to every case. The use of a given drug depends entirely upon the symptoms present and varies with each case.

What special method, then, shall we adopt of treating the continuous form of alcoholism? It is of course evident that if neurasthenic features be present and are treated, if the general tone and vigor be improved, the desire for stimulants will be lessened. In some cases it is possible merely by strict attention to hygiene; to matters of diet; to hours of sleep and regulation of the various functions, to bring about a favorable result, but in the majority of cases such simple means will not suffice, and it is necessary to institute measures involving some degree of restraint. Unfortunately, as civilized governments are at present constituted, forcible measures of restraint, except in very unusual cases, cannot be carried out, and there is at present no prospect of legislation upon this subject—so great is the prejudice against the interference with the liberty of the individual. If possible, however, the consent of the patient to comply with certain conditions of treatment should be gained. In a few instances the exaction of a promise or the signing of the pledge will suffice. In others again, and in by far the larger number of cases, more decided measures are necessary.

Men occasionally enter institutions for the treatment of inebriety voluntarily, and often, under the moral and social restraints of such asylums, the use of the drug is discontinued. A far better way—an ideal plan, but unfortunately a somewhat expensive one—consists in withdrawing the patient from his ordinary surroundings and instituting a system of absolute isolation and at the same time placing him in the care of a specially trained nurse. Such a plan as this is, in suitable cases, almost invariably followed by the most gratifying results—results which also are far-reaching and frequently permanent; for the isolation of the patient gives the physician the very best of opportunities for the study of the morbid conditions underlying the disease and for their proper treatment.

The plan of the writer is to institute a form of so-called "rest treatment." This plan, indeed, is followed in many cases even when the patient is not markedly neurasthenic, for the isolation in a room with a special nurse constitutes the most effective means of restraint that can be devised, while the moral effect is of the very best. It is the plan of the writer to place the patient *in bed* and to keep him in bed, not for days but for many weeks, and to institute at the same time massage, baths, Swedish movements, electricity, and such other expedients as suggest themselves from time to time or are indicated by the case. It cannot be too strongly insisted upon that the victim of alcoholism is the victim of disease, and that very frequently the relief obtained from various distressing symptoms by merely remaining in bed is so great as to be followed by a rapid diminution in the appetite for the stimulant.

The patient having been placed in bed, it is frequently found necessary to administer small doses of calomel and to follow these after a time by a saline cathartic. The digestive tract having thus been prepared, systematic feeding should be commenced. As a rule, it is best to begin with a liquid diet. This should at first be limited to beef-tea, broths, soups, and meat preparations generally. As soon as possible, however, a milk diet should be instituted. A great many alcoholics aver that they cannot take milk; that it increases the coating of the tongue, and that its ingestion is followed by nausea and loss of appetite; but as a rule we shall be able to administer milk if the proper precautions are observed. The simple expedient of adding a little alcohol answers every purpose, for it is then readily tolerated by the stomach and acceptable to the patient. At other times, instead of adding alcohol to the milk our purpose is answered by diluting the milk with some carbonated water such as soda-water or Apollinaris. In other instances, again, it is a good plan to peptonize the milk. The cold process is generally preferable, inasmuch as the taste of warm peptonized milk is so unpleasant to the average alcoholic that he will usually reject it. It is a good plan to add the peptonizing powder to the milk just before the latter is administered. Sometimes it is necessary to abandon whole milk and to give the patient skimmed milk or buttermilk. With regard to the amount of the milk, it is best to begin with a very small quantity, say three or four ounces given at intervals of two hours. Many patients who cannot take milk in large quantities can take it in small amounts at short intervals and digest it without difficulty. It will also be noticed that the quality of milk thus administered in twenty-four hours is insufficient to satisfy the wants of the patient. In two or three days as a rule, especially if the intestinal tract has been thoroughly emptied by the administration of calomel and salts, the patient becomes very hungry and accepts the small doses of milk eagerly. The amount of milk should then be gradually increased, an ounce being added to each dose daily.

It will be found expedient in a very few days, at most four or five, to begin with solid food; we should begin, of course, with small quantities. It may consist of soft-boiled eggs, Hamburg steak, boiled rice, stale bread, etc. Little by little the patient may be brought up to a full diet, the milk at the same time being increased. In other words, we apply to the treatment of an alcoholic patient the general principles of diet in the rest cure. Very soon it will be found that the patient is taking a very large amount of food, and that his condition is rapidly changing for the better. The nervousness resulting from the withdrawal of the alcohol subsides and the desire for the latter diminishes. His spirits also rapidly improve, the depression disappears, and he becomes bright and cheerful.

During all this time, it must be remembered, the patient is receiving daily full general massage and sponge, shower, or spray baths, while the muscles are stimulated by electricity—usually the slowly interrupted faradic current. As the cases progresses, Swedish movements with resistance are added. Soon it becomes necessary to permit the patient to leave his bed for small portions of time daily, until at the end of five, six, or more weeks he is up the greater part of the time. As soon as this is the case calisthenics and other room-exercises are instituted. Subsequently, according to the progress of the case, this should be followed by exercise in the open air—always, of course, in the company of the nurse.

It may occur to the reader that in chronic alcoholics a large amount of forced feeding such as I have here suggested is not indicated. A few minutes' reflection, however, suffice to convince us of the erroneousness of this view. In the first place, whiskey- and wine-drinkers are not apt to be obese. Even if they are, their tissues are soft, flabby, and in a badly nourished condition. Those patients in whom the greatest obesity occurs, namely, beer-drinkers, rarely come under our care or treatment as alcoholic subjects. Should, however, the alcoholic subject be obese, this feature must be taken into consideration in the dietary. It is hardly necessary to say that, in such cases, whole milk should be substituted by skimmed milk, that starches and fats should be as far as possible excluded, and that lean meats, fish, green vegetables, etc., should be given; in short, we should adopt the ordinary diet for the reduction of obesity. In the experience of the writer the greatest number of those who come under our care for chronic alcoholism are not persons who are obese, but rather patients in whom the weight is distinctly below the normal; some, indeed, are excessively thin.

Occasionally it is possible to conduct the entire treatment without the use of drugs, but, as a rule, the latter may be advantageously employed. Indeed, most frequently they are indicated. They are roughly grouped into three categories: first, those indicated by the symptoms arising from the withdrawal of the alcohol; secondly, those indicated by the deranged visceral functions; and, thirdly, those which are tonic, stimulating, or antagonistic to the action of alcohol.

The symptoms which arise upon withdrawal consist especially of markedly increased nervousness, of insomnia and sometimes of headaches. As a rule, the indications can readily be met by the exhibition of the bromides. These may be given in doses of from 20 to 40 grains every four hours. The insomnia may be combated by trional (gr. xx), and, if this be not efficacious, by sulphonal (gr. xv to xx) or hyoscine hydrobromate (gr. $\frac{1}{100}$ to $\frac{1}{60}$). The use of morphine is unjustifiable. Chloral may be used, but it had better be avoided.

As already stated there is almost always present a gastric catarrh, and this must be taken into consideration not only in the diet but also in the medicines prescribed. Nitrate of silver, gr. $\frac{1}{4}$, combined in pill form with extract of hyoscyamus, gr. $\frac{1}{4}$, and administered three times daily a half-hour or twenty minutes before meals, has, as a rule, a very happy action. Occasionally, however, lavage is necessary—though this, even in severe cases, need not be continued very long. Occasionally the morning nausea and vomiting of chronic alcoholics is very troublesome, but, as a rule, this readily subsides. Sometimes small doses of calomel are indicated, and in others phosphate of sodium can be given with advantage. The latter is best administered in doses of 15 grains in hot water early in the morning. At other times it may be given in an effervescent solution and repeated several times daily. Small doses of saline laxatives are also frequently of service during the first week or ten days of treatment.

The third category of drugs, as already stated, includes those which are tonic, stimulating, or possibly antagonistic to the action of alcohol, and it is unfortunately to these more than anything else that attention has been directed both by medical authors and by the advertising pretenders of specific cures. The writer does not deny that some of them are of value; in fact, he not infrequently makes use of them, but it cannot be too strongly insisted upon that they should not constitute the main factor of the treatment. They are merely adjuvants, and if employed at all should be selected and adapted to each particular case. The drug most commonly resorted to is strychnine. It is generally given hypodermically in the form of the nitrate. As a rule, it should be employed in moderate doses, say gr. $\frac{1}{50}$ or $\frac{1}{40}$, three times daily; although occasionally much larger doses, gr. $\frac{1}{20}$ or even $\frac{1}{15}$ (Dana[1]) may be given. In the writer's experience, however, large doses over-stimulate and tend to increase the nervousness of the patient. There can be no doubt that in most cases strychnine is beneficial, and that it markedly diminishes the depression of the period of withdrawal, and it may even tend, as is claimed by Phelps,[2] to impair the appetite for alcohol. Though it has not in the writer's experience so valuable a property, no harm can be done by its use, especially in moderate doses. In many cases we must admit that its use is followed by most gratifying results.

Another drug which is quite freely used is atropine. Its stimulating qualities are apparently of much service in many cases of alcoholism. Like strychnine it appears to lessen the depression caused by the withdrawal. It seems to diminish especially the distressing epigastric and sinking sensations from which alcoholics suffer. It

[1] *Post-Graduate*, New York, July, 1896.

[2] *Medical Fortnightly*, St. Louis, 1895, viii.

should be administered hypodermically in doses varying from gr. $\frac{1}{100}$ to $\frac{1}{50}$, three times daily, and preferably with strychnine. Clark[1] regards the combination with strychnine as almost a specific. He maintains that while strychnine acts as a nerve-tonic, the atropine has a special aptitude for decreasing the appetite for alcohol. Carter[2] also regards atropine as of special value. He declares that atropine given three or four times a day will produce a great distaste for alcohol in from one to five days—that whiskey becomes repellant both as regards sight and odor, and that its taste becomes intolerable, producing nausea. While this position is somewhat extreme, there can be no doubt that in cases in which there is marked depression with coldness and clamminess of the extremities the drug is extremely valuable, and it is not impossible that by combating these symptoms the atropine may indirectly lessen the craving for alcohol.

Among other drugs that are of use from time to time we should mention arsenic, iron, and bitter tonics. As regards the latter we should be careful, of course, not to prescribe them in the form of tinctures. As a rule, their exhibition in pill form with or without a small quantity of capsicum answers every purpose. Arsenic, if given at all, should be in the form of Fowler's solution and should be given well diluted for fear that the chronic gastric catarrh, almost invariably present, might be aggravated. The writer has found it of distinct value, especially in the latter part of the treatment. If iron be indicated it should be exhibited in the form of a peptonate, preferably associated with manganese.

A drug that has been brought into great notoriety in connection with alcoholism is the chloride of gold and sodium. It is not many years since that as "bichloride of gold" it was heralded far and wide by advertising pretenders as a specific for alcoholism. As a matter of fact the drug is almost inert, its action being that of an extremely feeble tonic and alterative unless it be given in large doses, when it acts as a gastro-intestinal irritant. Notwithstanding, there are not wanting medical writers who vaunt its merits, *e. g.* Oliver Edwards,[3] who ascribes to it not only peculiar specific properties but also declares that it brings about refreshing sleep and other equally remarkable things. It is very probable that the virtues attributed to the gold salt are really to be attributed to the concomitant use of strychnine and atropine. Carter is evidently of a similar opinion when he says that the antagonism existing between atropine and alcohol is the real basis of the gold cure.

Apomorphine is also occasionally used in the treatment of alcoholism, especially in systems of treatment in which the patient is allowed

[1] *New Orleans Medical Journal*, vol. xxiii. p. 721.

[2] *Medical News*, March 9, 1895.

[3] *Canada Medical Journal*, March, 1896.

all the alcohol he desires. If, in spite of the administration of strychnine and atropine, the patient continues drinking, apomorphine, gr. $\frac{1}{10}$, is given hypodermically at such times as the alcohol is taken. How unscientific this method is need not be pointed out. Comment is unnecessary. The same is true of any method of treatment which involves the substitution of another drug, such as morphine, cocaine, or chloral, for the alcohol: such practice cannot be too strongly condemned.

The writer is in the habit of applying to every case as far as possible the general principles of the rest treatment and employing strychnine, atropine, and other drugs only when indicated. It is certainly unscientific to treat every case in the same way. In cases treated on rest principles it will almost always be found, long before the treatment has been completed, in fact often before it is well under way, that the patient's appetite for alcohol has entirely disappeared. It will be found, further, after the treatment has been completed, that the tendency to relapse is very slight. It is all-important, of course, to guard the patient against exposure to fatigue, alcoholic subjects being very readily exhausted. This fact should be constantly borne in mind when the time comes for the patient to resume the ordinary duties of his vocation. The majority of cases of relapse are those in which some indiscretion, either in the direction of overwork or repeated attendance upon social functions that are attended by loss of sleep, has occurred.

The greatest difficulty is presented by those cases in whom there is a strong hereditary or neuropathic element. These are the cases in which drunkenness comes on in periods or well-defined attacks. It must be frankly confessed that in cases of this kind nothing short of forcible intervention and restriction is efficacious, and this forcible measure, as already pointed out, cannot be carried out in this country. Drunkards demand the same care as the insane, and special institutions or special control should be provided for them. In Austria a procedure known as the *Curatel* has been instituted. This consists in the legal appointment of a curator or administrator who acts in the capacity of guardian. Under the same provision public asylums for drunkards have also been established and they have met much favor. In this country we are compelled to resort to other and less effectual means. However, if it be possible to induce a periodic drinker to submit to a prolonged course of rest treatment, followed by exercise, the danger of recurrence of the attacks may be lessened. At any rate, in the management of such an individual, everything should be done toward keeping the organism at as high a physiological level as possible, paying careful attention to every function. We should be careful further to point out to such a patient the danger of

subjecting himself to severe nervous or other strain and to enforce, as much as possible, such a regularity of living that abundant time is given for sleep and for the digestion of food.

In treating alcoholics it is important also to study special symptoms, such as the neuralgic pains and headaches which they present, while we must also be on the lookout for signs of actual organic disease either of the nerve-centres or of the peripheral nerves. These will demand various additions or modifications of the general plan of treatment. It is remarkable, however, how thoroughly and completely these symptoms, as a rule, disappear during rest. Even mental impairment, as indicated by loss of memory, feebleness of will and judgment, and impairment of the moral sense, is capable of great improvement.

Of late years hypnotism has been suggested as a mode of treatment for alcoholism, more especially by Forel. Of its efficacy the writer has no personal knowledge. It is very doubtful whether any method of treatment which fails to recognize fully the pathological groundwork underlying the alcoholic habit can be successful. Certainly in all but very slight cases this can be no more powerful than in actual organic diseases. Crothers points out that alcoholics are, as a rule, very poor subjects for hypnotism.

MORPHINISM.

THE treatment of morphinism resolves itself into the treatment of the habitual and of the occasional users of the drug. There are some patients who, like the periodic alcoholics, make use of morphine or of opium only at certain periods and then again voluntarily abandon the drug. It is a common thing to find persons who suffer from recurring attacks of headache or neuralgia, or from menstrual troubles, periodic users of morphine. Women especially are prone to such periodic habits. However, whether the drug be used occasionally or periodically, the problem of treatment remains essentially the same; but, as can be readily inferred, the treatment of the periodic users of the drug is far more difficult than that of those who use the drug continually. In this connection it may also be pointed out that it is as a rule less difficult to treat successfully a patient who uses relatively large quantities of the drug but has done so for a short time only, than one who uses only small quantities but has used them for many years.

Various methods of treatment are in vogue, all of which, however, lay special stress upon the method of withdrawal of the drug. For instance, some writers advise immediate withdrawal; others rapid

withdrawal, and others very gradual withdrawal. Thus Gilles de la Tourette advises sudden withdrawal if the patient has been taking large doses, say 5 to 6 grains daily, and gradual withdrawal if the patient has been taking less than 5 grains; while Comby advises invariably sudden withdrawal. According to the writer's experience, it is best at first not to consider the question of withdrawal at all, but merely to institute such general measures as have been already indicated in the sections on Alcoholism. Here, again, no treatment is so efficacious as that of full rest methods. Partial rest methods fail. Full rest methods on the other hand are crowned with success. As in the case of alcoholism the patient should be placed in bed, should be carefully isolated, and should be placed upon a diet especially adapted to the case—one which contains large amounts of milk, fruit, and vegetables, and a relatively small amount of beef. The remarks already made in regard to the diet in alcoholism apply with but slight modifications here. As a rule the white meats (fish, oysters, breast of fowl, etc.) are not only well digested but are found more beneficial than the red meats (beef, lamb, etc.). Rice again presents itself as an admirable article of diet. In addition to the rest and the special feeding, bathing, massage, and electricity should be systematically employed.

It is the practice of the writer not to begin withdrawal of the drug until after rest treatment is fully under way. We must remember that the morphine *habitué* labors under an excessive fear lest the drug be withdrawn too soon. Besides, sudden withdrawal always implies a period of frightful physical and mental suffering. Further, the patient is, as a rule, intensely distrustful. I know of no class of patients with whom it is more difficult to establish friendly relations or in whom it is more difficult to inspire confidence. However, if the patient learns after his first few days of rest and isolation that he is still receiving his hypodermic injections or that he is still being allowed his usual quantity of laudanum or opium, confidence sooner or later asserts itself, especially as the physical comfort resulting from the bathing, massage, and proper diet soon becomes pronounced.

The practice of the writer is almost invariably that of very gradual withdrawal. The withdrawal should be so slow at first that the diminution of the dose is practically imperceptible; later on, the reduction may be more rapid. If the patient has been in the habit of receiving hypodermic injections it is the plan of the writer not only to gradually reduce the dose in the manner indicated but also to begin adding to the injection small doses of the nitrate of strychnine, say $\frac{1}{50}$ of a grain, and if the skin be very moist small doses of atropine sulphate, say $\frac{1}{200}$ of a grain. It is needless to say that after the morphine has been discontinued entirely, hypodermic injections of strychnine

or of strychnine and atropine may be kept up for some time without informing the patient of the change. The physician should be especially cautioned not to make use of cocaine during withdrawal, or in fact at any time, inasmuch as the patient may sooner or later acquire the cocaine habit with results equally disastrous. Besides, a large number of patients that come under our care for the morphine habit have already acquired the cocaine habit. The same remarks apply to the use of alcohol. Many of our cases, indeed, are instances of the "triple" habit, namely morphine, cocaine, and alcohol.

In the management of morphine cases isolation is absolutely imperative. No one should have access to the room save the nurse and the physician. No letters, packages, or newspapers should be admitted to the room under any pretext. Patients practise all sorts of devices to secure possession of the drug. Bribery is attempted with servants, or an order for the drug may be written on a piece of paper, the paper wrapped about a coin and the missive thrown out of a window; in the writer's experience this method has several times enabled the patient to procure the drug. It is remarkable also to what extent friends and relatives will enter into collusion with the patient to supply them with the stimulant, all fearing that the doctor is practising great cruelty and is withdrawing the drug too rapidly. Vigilance in such cases cannot be too great.

The reason for withdrawing the drug in the gradual manner above described is not only to diminish the sufferings of the patient, but also to prevent the onset of serious symptoms. Every now and then, if the drug be abruptly withdrawn, all of the signs of collapse, diarrhœa, sweating, cardiac weakness and dyspnœa, with excessive prostration, may set in. In other cases, again, mental symptoms resembling those of confusional insanity make their appearance, the patient becoming hallucinatory, delusional, and finally delirious. Such symptoms are not apt to make their appearance if the drug be withdrawn in the manner indicated and under fully established rest conditions.

The treatment of the morphine habit by the rest method should be continued for a very long period. In the writer's experience, the period which is sufficient for ordinary cases of neurasthenia or hysteria is totally insufficient for cases of morphinism. A course of three months of treatment is as a rule absolutely demanded, and in many patients the treatment should embrace five, six, or even seven months. The writer does not mean to imply that the patient should be kept in bed during all of this period, but that full rest methods should be kept up for from three to four months, and after this a partial rest treatment should be instituted, the patient being up and out of bed and exercising out of doors daily for some three or four hours. In cases so treated the writer has met with most gratifying results.

Success, it need hardly be stated, is still further assured if the patient's nurse accompany her to her home or elsewhere and remain with her for a period of several months longer. If practicable, the entire length of treatment under the supervision of the nurse should extend over a year. In no class of patients is relapse so apt to occur as in morphine cases, and it is for this reason that every possible precaution should be taken, provided the patient's means permit it.

With regard to the management of morphine cases subsequent to the rest treatment, the general principles already indicated in the sections on Alcoholism are applicable here. Everything should be done in the way of proper diet and exercise to keep the patient's health at as high a level as possible. But here also it is important to avoid fatigue and especially strain, excitement, and worry. Many cases presenting special difficulties are cases in which the habit has been acquired for the relief of a painful affection which still continues—as, for example, a persistent neuralgia, frequently recurring headache, or painful menstruation. It is needless to point out that every effort should be made to discover, and if possible eradicate, the cause of the painful affection whatever it may be, treating the headache or neuralgia upon such principles as are indicated, or if functional or organic disease of special structures be present, *e. g.* pelvic disorders in women, instituting such means, medical or surgical, as are necessary.

Because morphine patients are so untrustworthy, and because the means of obtaining the drug save under absolute isolation are so many, the physician should carefully watch the patient in order to learn whether the drug is really being withdrawn. Absolute supervision is only possible under absolute isolation, and yet by the most unexpected means the patient may be placed in possession of the coveted stimulant. However, if the quantity of the drug administered is really being diminished, certain symptoms inevitably make their appearance. They are, first, restlessness which may become very marked and is accompanied by more or less insomnia. The patient also yawns a great deal or sneezes, complains perhaps of having caught a slight cold, or perhaps has an attack of difficult respiration simulating asthma. In addition to restlessness the patient manifests signs of fear, complains of a sense of oppression, declares himself dissatisfied with the treatment, and insists upon going home. Involuntary movements of the legs and arms also make their appearance, the limbs being thrown about the bed. At times this is merely due to restlessness, at other times distinct involuntary jerkings make their appearance. Intention tremor also becomes evident. When, for instance, the patient attempts to pick up a glass of water it is noticed that he trembles decidedly. Sometimes instead of an asthmatic attack all the symptoms referable to a cold in the head or a spasmodic

cough may make their appearance. Sometimes vesical tenesmus is noticed. Palpitation of the heart may be also evident, or the patient may complain of fluttering sensations in the præcordia.

It stands to reason that, if none of the above symptoms are present and if the patient continues comfortable and in good spirits, sleeps well, and is contented with his surroundings, he is obtaining the drug surreptitiously. It should be remembered that even under very gradual withdrawal some of the symptoms above mentioned make their appearance, and may indeed become so marked as to necessitate for a time a return to a larger quantity of the drug. No picture is more alarming than that often presented by morphine patients in the stage of withdrawal, especially if the depression produced by the vomiting and diarrhœa be accompanied by mental confusion and delirium. These symptoms cannot be relieved by other remedies, and a recourse to morphine for a time is not only indicated, but is really the only course to pursue. The history of withdrawal in a confirmed case of morphinism is, in the experience of the writer, not a steady and unbroken decrease in the quantity of the drug, but consists of a series of diminutions, the progressive decrease being every now and then broken by a return to a slightly larger quantity. The detailed method of diminution depends largely upon the individual case under treatment. The writer, as a rule, continues for a number of days the quantity of morphine which the patient habitually takes; he then begins the diminishing of doses given in the early portion of the day; those given at night are continued in full quantity for a somewhat longer period. This is contrary to the practice of others, who begin by diminishing the evening doses. In the writer's experience, cutting off the evening doses makes the patient restless and sleepless, while the diminution of the morning dose, though producing restlessness, is not attended by the great disadvantage resulting from insomnia and its attendant evils. No hard and fast rule can, however, be said to apply. The patient should be given the drug when he needs it most, and it should be first diminished or withdrawn at those periods when he needs it least. Inasmuch as morphine injected hypodermically is eliminated by the stomach and is subsequently reabsorbed by the intestines, Hitzig has suggested that in treating morphinism we should systematically wash out the stomach. This seems to the writer to be an unnecessary precaution. The procedure is one that adds greatly to the distress from which the patient is already suffering, and it is doubtful whether the morphine thus gotten rid of is really large in amount.

As already stated, during withdrawal we should make free use of hypodermic injections of strychnine nitrate and atropine sulphate. As in the management of alcoholism, the dose must be adapted to

each case. In morphinism much larger doses of these drugs are tolerated. However, in many cases it is possible to bring about withdrawal without their use. Occasionally it is a good plan to use digitalis or strophanthus. As the treatment progresses, and during the convalescent period, bitter tonics, mineral acids, iron, arsenic, malt, and other nutrients may be added as may seem expedient.

Among drugs to which especial virtue in the treatment of morphinism has been ascribed we should mention the phosphate of sodium. It has been especially advocated by Luys.[1] He believes that it has a supporting action on the nervous system and should be given hypodermically. Beyond purely theoretical considerations the drug has nothing to recommend it. Codeine, which is recommended by Skene, Mattison, and more recently by Keugla,[2] is merely a makeshift substitute and should not be resorted to. Caffeine, also recommended by some writers, may occasionally be used in cases in which withdrawal is followed by great depression or in cases in which the early morning depression is very marked. It is best administered hypodermically. It should not be given toward evening for fear of adding to the insomnia. Insomnia and restlessness not infrequently demand the use of the bromides. The bromide of ammonium may be given in doses of 30 to 40 grains at intervals of four hours. Trional may be used in its stead, especially toward night. At times sulphonal may be given, but if possible it should be avoided, as should also chloral, as both of these drugs favor the confusional delirium occasionally met with in severe morphinism. The hot bath offers a harmless and often a very efficient method of combating the insomnia. Suggestion, advocated by some writers, with or without hypnotism, is of little or no value in the treatment.

A discussion of the treatment of morphinism is perhaps incomplete without referring to one of the means by which the habit is often brought about and perpetuated—a means, moreover, which is largely under our own control. A painful fact thrusts itself upon us in that the morphine habit generally has its origin in the prescription of the drug by a physician for some transient affection. Physicians cannot rid themselves of the great responsibility involved in the abuse of this drug, and it cannot but be admitted that it is too frequently prescribed for comparatively trivial affections and that some physicians are altogether too ready with the use of the hypodermic syringe. Every prescription containing morphine for the relief of pain should be marked above the physician's signature with the imperative order not to be renewed. Refilling a prescription so marked renders a druggist liable to prosecution, and physicians can, by this simple

[1] *Gazette des Hôpitaux*, Paris, 1895.

[2] *Occidental Medical Times*, 1895, xi. p. 541.

expedient, exercise a certain amount of control over their patients. Further prescriptions for the relief of pain should be for a few doses only, and the patient himself should be warned against the unnecessary repetition of the dose. Again, it has a number of times come within the knowledge of the writer that a physician has directed patients to purchase hypodermic syringes in order that he should not be annoyed or disturbed by too frequent calls. Such a course cannot be too strongly condemned. Another and prolific source of the morphine or opium habit is the ease with which narcotics can be purchased by the layman, and although laws exist which forbid the dispensing of poisons and narcotics without physicians' prescriptions, violation of the law is a matter of very common experience.

COCAINISM.

As mentioned in the last section, cocainism is sometimes acquired as a concomitant of the morphine habit or during the unscientific treatment of the latter. A far more frequent cause of the cocaine habit, however, is the use of the drug in the treatment of affections of the nose. Not only is cocaine applied by the surgeon preparatory to the performance of trivial operations, but it not infrequently happens that the patient is furnished with a solution containing cocaine which he is directed to apply either by means of a cotton pledget or by means of a spray. Within the writer's knowledge not a few cases of cocainism can be traced to some misapplication of the drug, the victim not infrequently being himself a physician. In prescribing cocaine for purely local affections we incur a responsibility not less than that which we incur in prescribing morphine. We should never lose sight of the fact that every local application is accompanied by a certain amount of general action. After the use of cocaine over a large mucous surface, such as the nasal chambers, the patient experiences not only local anæsthesia but a comfortable sense of warmth and well-being diffused all over the body. Further, the nerve-centres are stimulated, especially if the doses have been large, very much as they are stimulated with alcohol, save that the stimulation is far more intense and sudden.

A patient upon whose nasal chambers cocaine has been freely used soon becomes talkative, often boastful, but in a little while fatigue and relaxation supervene. Soon he experiences a need for the repetition of the dose, and little by little the habit is established. If the drug be withdrawn for some time, or if the patient fails of access to the stimulant, he is soon seized with a feeling of great discomfort, of

marked oppression, of faintness, palpitation, and general nervousness. There is in addition a marked mental irritability which is manifested by sharpness and shortness of speech and jerkiness of manner. The cocainist soon becomes unable to attend to his business. He becomes readily and excessively fatigued. In a short time also it is noticed that judgment and memory become impaired and his regard for truth becomes as small as that of the morphinist. Often he is full of business which is never completed; he is talkative and boastful, but neglects his obligations. At the same time it is noticed that he is pale and haggard; that his general nutrition is much impaired and that his weight is below normal. Often he presents a picture of premature senility. His reflexes are exaggerated. His movements are those of unrest and constant change of position. At times his muscles are the seat of spasmodic twitchings. His pupils are dilated. Frequently there is tremor of the tongue and sometimes of the hands. His pulse is rapid and he frequently suffers from palpitation. His skin is apt to be cold and moist. He sleeps but little, often indeed insomnia persists for days. In addition he may present various symptoms of mental confusion and delirium. Sometimes he is the victim of delusions of persecution. At other times he becomes, if married, insanely jealous, and may, as in alcoholism, entertain the delusion of marital infidelity.

During the withdrawal of the drug these symptoms become much exaggerated, and we have recounted them in brief in order that the physician may be able to tell whether withdrawal is actually taking place. Contrary to what one might expect, it is, as a rule, practicable to withdraw cocaine far more rapidly than either morphine or alcohol. It is true that insomnia, palpitation, dyspnœa, and collapse are liable to occur, but they can be much more readily controlled. The writer, as a rule, practises immediate withdrawal. The bromides, especially when associated with 5 or 10 grains of antipyrin, are very efficacious in combating the symptoms. Coffee assists materially in lessening the depression during the day, while the insomnia can, as a rule, be readily combated by means of trional or sulphonal. As already stated, the cocaine habit may have been acquired in the attempt to cure the morphine habit and cocainism and morphinism may exist together. In such cases the cocaine may be entirely withdrawn at once. The morphine, however, should be withdrawn in the gradual manner already described. Similarly, the patient may be the victim of the so-called "triple habit," that is, he may use not only morphine and cocaine, but also alcohol. Here the problem presented often taxes our ingenuity. As a general rule, however, it may be stated that it is expedient to withdraw the cocaine at once, the alcohol rapidly, and the morphine slowly. The morphine distinctly overshadows the other drugs, and,

as a rule, it had best be continued in full doses for a number of days. Later it may itself be gradually diminished. In other words, the treatment of this "triple" habit resolves itself sooner or later into that of simple morphinism.

It cannot be too strongly insisted upon that rest and isolation as detailed in the sections on Alcoholism and Morphinism apply equally to the treatment of cocainism. The cocaine patient is as little to be trusted as the morphinist. Confinement in a room under the supervision of a trained nurse, and to which room no other person but the physician has access, presents practically the only favorable prospect of cure. As in the case of morphinism, this isolation should be practised for from two to three months. The general principles already indicated with regard to the use of tonics in the convalescent period of morphinism apply equally here. We should remember that our patient is below weight, and that he presents the symptoms of nervous exhaustion to a profound degree.

CHLORALISM.

THE chloral habit is far less common than the other drug habits thus far considered. Like morphinism it frequently owes its inception to a prescription by a physician for some transient disorder, the patient renewing the prescription without the physician's knowledge or consent. Little by little the patient becomes accustomed to its use and soon cannot sleep without it. It is a poison which is depressing to the heart and vasomotor apparatus. Dyspnœa, vertigo, and general sense of weakness are among the symptoms apt to be present. In well-established cases there is marked nervousness, marked insomnia, and a certain degree of mental weakness as manifested by loss of will-power and failure of memory. In some cases an emotional depression is present which sometimes hardly falls short of actual melancholia. The patient is weak, his movements are tremulous, and he frequently complains of palpitation of the heart.

The treatment of chloralism is to be carried out on the lines already indicated. Care should be taken, however, not to withdraw the drug too suddenly, inasmuch as all of the symptoms of its use become rapidly accentuated by sudden withdrawal. In the experience of the writer the chloral habit is more difficult to treat than any other drug habit, inasmuch as the insomnia resulting from its withdrawal is so great that other narcotics, such as trional or sulphonal, must be employed. At times even morphine must be resorted to. The danger is, of course, that the patient may thus acquire a new habit. Occa-

sionally he suffers so severely from the enfeebled action of the heart that it is necessary to prescribe alcohol, and under these circumstances if care be not exercised, the alcoholic habit may be formed. However, the general principles already indicated in the previous sections should be closely followed. Isolation, absolute rest in bed, with massage, bathing, forced feeding, and perhaps the use of electricity should be instituted. The drug should always be withdrawn very gradually, and if possible without the substitution of any other narcotic. Indeed, it may be safely said that any treatment which embodies the substitution of some other narcotic is in danger of failure. Strychnine, atropine, and digitalis should be freely used in order to tone up the weakened heart and vasomotor apparatus. The treatment should never be entered into without a full appreciation of the dangers of withdrawal. The withdrawal should never be begun without full isolation, because, in the writer's experience, the patient is in danger of beginning the free use of alcohol, being driven there by the intense psychical and physical depression.

OTHER DRUG HABITS.

It not infrequently occurs that patients become the victim of narcotic habits other than those already discussed. Sometimes, also, some of the less commonly used narcotics, such as paraldehyde, somnal, or chloralamide are the stimulants to which the patient becomes addicted. One of the worst and most horrible cases of drug habit which it has been the writer's fortune to treat was a case of paraldehyde habit in which the patient took enormous doses of this disgusting narcotic daily. The patient constantly reeked with the unpleasant odor of the drug, while her mucous membranes were ulcerated and her form much emaciated. Occasionally ether and chloroform are used by inebriates. Among the rarer forms of drug habits met with at the present day are the phenacetin and antipyrin habits. These habits, however, are less harmful than those already mentioned and can, as a rule, be more readily treated. General principles, of course, are to be applied to the treatment of a drug habit no matter what its cause. Among these let us re-state—first, the isolation of the patient in such a manner that his access to the drug save as administered by the physician is absolutely cut off; secondly, the employment of such therapeutic measures as will bring the general level of the patient's health up to the normal. The permanence of the result obtained depends in a large degree upon the influence of friends and relatives.

It certainly seems no more than proper that the victim of a con-

firmed toxic habit should be placed under legal restraint, and yet, as our laws are at present constituted, the legal restraint of inebriates is impossible unless the habit has led to actual insanity. Both courts and lawmakers should realize the fact that the confirmed inebriate is thoroughly irresponsible, and is as much in need of the protection of the law as the insane man. Restraint, we should remember, is protection in another form. Let us hope that the day is not far distant when some plan like that of the Austrian *Curatel* will be instituted in this country.

THE DISORDERS OF SLEEP.

By HUGH T. PATRICK, M. D.

The disorders of sleep are to be classed with pain, dropsy, dyspnœa, and other distressing conditions that are simply symptoms of disease; and the rational treatment of these symptoms means the treatment of the underlying malady. But, as continuous pain may exhaust precious vitality and the organism demand relief without reference to the cause; as dropsy may seriously impede respiration or circulation and call for surgical intervention as a purely symptomatic treatment, so disturbances of sleep, although simply indicative of a morbid condition, may be, when prolonged, something more and require treatment as a pathological entity. More than this, the disorders of sleep—in particular the loss of sleep—may be powerfully retroactive, aggravating the original and causative disease. It has been said that "the greatest of all conservative agents is sleep," and it is known that man is able to do without this "sweet restorer" approximately for the same length of time during which he can abstain from food; that is, about three weeks. That the well must sleep to remain well and that the sick must sleep to recover health would seem to be self-evident; but I am not in the least sympathy with such statements as the following from a prominent author: "In my opinion no one cause is so productive of cerebral affections as persistent wakefulness; for not only is the brain prevented from obtaining rest, but it is kept in a state of erethism which, if not relieved, must sooner or later end in organic disease." This may be true as regards isolated cases, but it teaches a bad pathology and encourages irrational and short-sighted treatment. Insomnia is the result, not the cause, of cerebral affections, and it does not give rise to organic disease. It may be the earliest manifestation of otherwise latent brain-disease, and the conscientious physician will search this out and treat it; not attempt to avert some indefinite and vaguely threatened disaster by attacking the insomnia.

Disorders of sleep are pre-eminently derangements for which routine prescribing is to be sedulously avoided. For this reason, although it is the symptoms that claim our attention, it has been thought best to treat of them to the greatest feasible extent under

the head of the different maladies of whose semeiology they make a part. Finding it, however, impossible to adhere strictly to this plan the arrangement followed has been chosen as a compromise, not logical but convenient, and the subject is introduced with a few detached suggestions.

There is no rule regarding the *amount* of sleep required by the normal individual. Following precedent and the results of personal observation I should say that eight hours is a fair average; but there are healthy persons who need only five hours, and others equally vigorous and active who want nine, ten, or even twelve hours of sleep. Women require more than men, and children more than adults. Regarding the requirements of advanced years authorities differ, but those who hold that a hale and hearty old age may be passed on less sleep than is necessary for the aggressive period of life seem to have the facts in their favor. It is said that manual laborers need more sleep than persons engaged in sedentary pursuits, but this can be true only in a general way. Intense mental application should have for counterpoise the recuperation of long hours of sleep. There is no doubt that a man's intellectual efficiency is closely related to his ability to sleep. But the amount of sleep cannot be regulated by a schedule of hours: the requirements of each individual organism must be the sole determining factor, and this is all the more imperative because the quality of sleep is of almost equal importance with its duration. If a person sleep eight hours and awake unrefreshed, there is something the matter, and such a state of affairs should not be allowed to continue. But the converse—or rather the apparent converse—does not hold strictly true, for in this, as in other matters medical, the statement of the patient is not always to be accorded implicit reliance. Some young men think it rather fine to be preternaturally active, to retire exceedingly late, sleep little, and still be efficient during the day. This is not physiological, and they may be regarded as laying up calamity for the future. Corresponding to this, there are foolish young women who have a pride in attending some social function nearly every evening during the season. They are providing hardships and distressing nervousness for after-life. These are indiscretions, not idiosyncrasies, and are for the family physician to prevent. Even apparently well-balanced business and professional men, physicians included, occasionally feel an abnormal gratification in working hard on insufficient sleep. For all such the following hints are considered to be *apropos*.

The tendency to sleep is not to be habitually resisted, much less is it to be overcome by means of tea, coffee, or other stimulants. Affairs of the day should never be carried into the night: utilizing the quiet hour after retiring for the solution of knotty problems can only be

condemned. After a sufficiency of sleep waking naturally follows, and the person who has to be rudely awakened is one who is curtailed in his allowance of slumber. To this rule there are exceptions, the sluggard being still extant, although the genus seems to have comparatively few representatives in this country. For the healthy individual the practice of taking a siesta is scarcely commendable. Nature's sleeping-time is the night, and if adequate sleep be then obtained the day nap is apt to do more harm than good. But for men whose occupation inevitably entails irregular hours, the faculty of sleeping at will is of inestimable value. Nearly every healthy individual can acquire this habit—numerous assertions to the contrary notwithstanding. This oft-affirmed inability, like the incapacity to digest milk, is generally a subjective myth. The word habit implies personal custom, and the faculty in a majority of cases is not acquired without cultivation. The general practitioner, especially, should court this gentle mistress with assiduity, as success may mean added years of health and usefulness. The habit of waking promptly and completely may also be cultivated and is greatly to be desired.

If there be such a thing as *simple insomnia,* it is the insomnia of habit. This may have originated in an adequate cause which has ceased to act, or it may have developed from bad usages in daily living; occasionally it is due to short-sighted or thoughtless training by parents. The subjects of such insomnia seldom attain to the dignity of "cases," and need only a few instructions regarding the formation of a proper sleep habit. A room, cool, quiet, and well ventilated, preferably with a single occupant; a sufficiency of covering, and if necessary a hot-water bottle, to counteract the physiological decline of temperature that occurs during sleep; an evening meal not necessarily light, but easily digested; a tranquil evening; a regular hour for retiring: these belong to the hygiene of slumber.

After *excessive physical exertion* even the most vigorous may be sleepless. For such, a hot bath followed by some hot, light food or hot, mild stimulant will meet every requirement.

DISORDERS OF SLEEP IN NEURASTHENIA AND HYSTERIA.

For the purposes of this article nice nosological distinctions are considered unnecessary, and the above terms are used loosely so as to include what is ordinarly understood by nervousness and the neurotic disposition. Belonging to these diseases or conditions are a host of abnormalities relating to sleep which may arbitrarily be segregated

into insomnia, distressed sleep, disturbances peculiar to the times of falling asleep and awaking, and excessive somnolence. The last is considered under Narcolepsy.

Insomnia.—On the threshold of a consideration of the practical therapeutics of the insomnia of nervous people, one involuntarily recalls the hackneyed recipe for cooking a hare. The first requirement in every case is to determine the presence of insomnia and its extent. For this purpose the statements of the patient are untrustworthy data. The troubled victim perhaps protests that he has not slept a wink for a week, or that he has averaged half an hour a night for months—assertions that shed considerable light on his mental state, but afford no accurate information as to his hours of sleep. Recalling the fact that loss of sleep for three weeks means death, the absurdity of these common and extravagant statements is obvious. Absolute wakefulness is not a common symptom of neurasthenia, and should never be assumed to exist except upon the authority of a second person. If a reliable nurse or member of the household determine the continuous absence of sleep, apprehension should be entertained of grave organic disease or of a psychosis—at least something more serious than neurasthenia or hysteria. In arranging such surveillance, however, it is well to have the patient ignorant of the fact, for it would be pretty certain to make him more wakeful and vitiate the observation.

Having confirmed beyond a peradventure the existence of insomnia, the next step is to ascertain its nature, to discover its proximate and remote causes, as well as to carefully investigate any coexisting disorders which apparently have no connection with the symptom in question: in short, to make an exhaustive clinical examination. The interrogations cannot be too searching, nor can the physical exploration be too thorough. Details relating to the sleep habit must be accurately known. Falling within this category are the sleeping apartment, its occupancy, heating, ventilation, sewage, and tranquillity (or lack of it); the character of the bed and bedding, not ignoring the possible existence of vermin; the hours of retiring and rising; customary and unusual disturbance. Passing now to the day, the habits from rising to retiring next undergo the scrutiny of the medical adviser. Occupation, aims, ambitions, food, drink, exercise, diversions, associations, and particularly the manner of spending the evenings, are reviewed, the possibility of drug-addiction being never forgotten. When private worries or secret passions constitute the foundation of the trouble the physician cannot be too tactful in investigation (and, it may be added, in treatment), but he should not fail to find the *fons et origo* of the mischief. Above all, any rooted trouble, fixed worry, or imperative conception, especially of a hypochondriacal nature,

must be unearthed. For example, the unfortunate subject may be absolutely unable, in the unoccupied moments after retiring, to free himself from the idea that he has cardiac disease, incipient insanity, or that paralysis is impending. Sometimes more trivial subjects as seriously engage his attention. The thought of burglars, a man under the bed, or the possibility of fire; a harassing doubt as to whether doors have been locked, lights extinguished, or other duties properly performed may keep sleep from weary eyes. Some persons are wakeful simply from excessive anxiety to sleep: from a too ardent wooing of the "gentle mistress." They lie awake to watch the approach of slumber.

It seems needless to insist that the state of every organ is to be determined, and that it is not sufficient to know that the patient is struggling with financial difficulties, brooding over domestic infelicity, or suffering from consuming grief. He may in addition have nephritis, valvular disease, or incipient dementia paralytica. That insomnia is an early symptom of many diseases, and may be for some time the sole distressing manifestation, should be notorious.

Putting aside for the present the organic, toxic, and other cases to be considered later, and confining our attention to ordinary nervous sleeplessness, I would again insist that insomnia as an isolated disorder—simple insomnia—is a great rarity. Except occasional instances of habit-insomnia, loss of sleep is only one part of a symptom-complex. It is not rarely the one crying complaint which makes existence a burden, but investigation at once reveals the more or less perfect picture of hysteria or neurasthenia. The treatment of the symptom, then, is naturally the treatment of the neurosis. But here at once a sharp distinction must be drawn between two classes of cases; in my opinion, at least, this distinction should ever be clear in the mind of the physician, although it may be difficult to draw the line in individual instances. On the one hand, there is true nervous exhaustion: the overdrained, overstrained nervous system that needs principally rest and replenishing; the person worn by work and worry, eaten by ambition or passion, prostrated by mental shock, who needs repose, diversion, nutrition. On the other hand, a nervous system, particularly a cerebral centre, naturally imperfect in many respects, ever in a state of unstable equilibrium, easily thrown out of balance, producing effects out of all proportion to cause. This is the individual of neuropathic temperament, the victim of his cerebrum. He may be for years entirely normal and is not unlikely to be brilliant in some respects, but to be possessed of an imperative conception seems to be his fate. He is usually self-centred, hypersensitive, and wanting a perfect co-ordination of mental powers. These persons are nearly all, at one time or another, insomniacs. Some of them are more: they

are truly insomnomaniacs. These are the *zur Krankheit erwählten* of Meynert, the chosen ones of disease, who most severely tax the physician's wisdom and patience. Among them alone is to be found insomnia as a psychotic equivalent—that is, taking the place of an attack of insanity. Here, too, hereditary insomnia must be sought, if it ever exist. I am inclined to think that so-called hereditary insomnia is frequently only habit-insomnia born of a hypersensitive nervous system, and, as is frequently the case with hysteria, fostered by the progenitors who transmitted the neurotic tendency.

Contemplating now these two classes of cases, it is at once apparent that they will need radically diverse treatment. The first calls for the rest cure in the widest sense of the term, and little more. We have to do with a state of nutrition and function which is produced by a sufficient cause, and which, under favorable circumstances, we expect to be temporary. With proper precautions hypnotics and sedatives may be given with a free hand. In the second class we are confronted by a condition which may be, and generally is, as unalterable as the leopard's coat. Above all others these are the cases in which the individual is to be managed, and the disease, or at least the symptoms, neglected. To this class belong the neurasthenics whose trouble was started by a slight cause and continued to grow long after the cause ceased to exist. Such are laborers who have become permanently nervous after over-lifting; such are most of the cases of the so-called traumatic neurosis and post-operative nervous states. Here careful investigation will bring to light a brooding of one kind or another, with the gradual development of a fixed idea that is generally subconscious—a veritable mental possession. These patients are to be vigilantly protected from hypnotics and stimulants. The treatment must be essentially and continuously mental. The mind may be reached from many points, along numerous channels, but the objective point must be ever the same and always in view. Oftentimes these real unfortunates must be trained anew in ways of life and habits of thought. Instead of rest they should be given occupation, and instead of freedom from care gradually increasing responsibility; instead of drugs, personal influence and support. The development of self-discipline, self-control, hope, and confidence should be the constant aim, to the neglect, if need be, of dyspepsia, constipation, vertigo, or insomnia. A wide grasp of the subject, a buoyant courage, a ready tact—these, and not a prolific formulary, make the effective armamentarium.

As the personal equation is so prominent a factor in treatment, the medical interviews should not be too infrequent. The ordinary experience is that after seeing his physician the patient feels relieved and encouraged—as many of them express it, "lighter" in mind and

body. But this exhilaration and improved tone are not enduring, and the patient needs anew his plunge into the fountain of recuperation. Unless the medical adviser can be truly such a fountain he is not the ideal physician. For this reason, more than any other, the practitioner who is really an enthusiastic and persistent electro-therapeutist, hydro-therapeutist or dieto-therapeutist achieves brilliant results with his favorite treatment.

Perhaps the first thing to teach the true neurasthenic and the insomnomaniac alike is that they are not dying from want of sleep. Though the loss of sleep be very considerable, even sufficient to seriously impede recovery, it is well to reassure the patient. He will sleep better for it. The mere knowledge of insomnia and the anxiety it begets prevent sleep. But it is frequently wise to enforce this assurance and demonstrate to the patient that he can sleep by administering for a few days an adequate hypnotic. For this purpose full doses are advised. It is much better to begin with a large amount and diminish it than to give at first small, tentative doses and be forced to increase them. The choice of drug is not of vital importance, but it should be one that has not already been taken and the patient should never know what it is. Personally, I like trional, about 20 grains, taken with some hot liquid three-quarters of an hour before the sleeping-time. If the heart be perfectly competent, a full dose of chloral, or chloral and bromide, is not objectionable. A good plan is to give 30 or 40 grains of bromide three times a day. Sulphonal is not appropriate for this purpose unless it is wished to prolong the effect of the somnifacient into the day. This is at times desirable. Occasionally the true neurasthenic, as well as the neuropathic insomniac, becomes frantic from worry and loss of sleep, and then to keep him for a few days drowsy and quiet is to start him on the way to recovery. To accomplish this sulphonal is well adapted, as it acts slowly and with prolonged effect. A single full dose (20 to 30 grains) with a glass of hot milk, at least two or three hours before bed-time, will often suffice. If not, a less amount (10 to 20 grains) in the morning will complete the effect. But such treatment is always a temporary expedient or an emergency resort. Milder measures alone are to be used continuously.

For the less aggravated cases, the moderate insomnia and slight neurasthenia of students and of professional and business men, simple changes in the habits of life are generally sufficient, provided they are conscientiously adhered to. A material shortening of the hours of work—that is, a definite curtailment for a definite or sufficient time; well-regulated out-door exercise; a cold morning sponge; proper diet; a quiet evening of humdrum conversation or light reading followed by a hot bath and timely retiring, constitute the

leading features of the treatment. In some persons a hot bath causes wakefulness. A cool bath, a brisk walk, exercise with Indian clubs, dumb-bells, or pulley apparatus may then be substituted. Change of climate is desirable, preferably not to an elevated region; but change is more important than altitude. It goes without saying that, as a rule, watering-places and much frequented resorts are to be avoided. For most cases of moderate exhaustion, life in the woods is an ideal treatment, but it will at once occur to every observer that for some neurotics, given to brooding or with a marked hypochondriacal tendency, seclusion may be the worst possible treatment. Cases that require much society, however, with constant diversion are much rarer than is generally supposed. Most of those thought to be such need systematic occupation.

When the loss of sleep is more considerable, the accompanying symptoms more distressing, and the general condition of the patient has suffered, something must be added to the foregoing regimen. Much is to be done, however, before recourse is had to drugs. A full consideration of the broader measures that are useful in the insomnia of nervous people necessarily involves a discussion of the treatment of neurasthenia and hysteria. This is not my province, but a few general directions bearing especially on the symptom under discussion are considered to be in place.

For neurotics who are vigorous in body it is well to prescribe outdoor occupation, or a long rapid walk before bed-time, or even both. When true nervous exhaustion is present, physical fatigue is not to be recommended. For both classes, a reduction of disturbing noises to a minimum is desirable. In this connection the experiment of Strümpell, which has been repeated by others, is more than suggestive. A patient who was completely anæsthetic had lost the use of one eye and one ear. When the good eye was closed and the good ear occluded, that is, when all communication with the external world was cut off, the patient immediately went to sleep. This proceeding may be imitated to a slight degree in the case of hypersensitive persons by the use of antiphones. Of these the device of Rosenbach and that of Scripture are probably the best and simplest. The former consists of a thin tongue of cotton wadding about 6 by 3 cm. smeared with vaseline and rolled into a cylinder, the ends being slightly pinched in the process. This is introduced into the meatus to a depth of 2 or $2\frac{1}{2}$ cm., the protruding end is flattened out in the concha and covered with a layer of vaseline and cotton. The whole is removed in the morning and the meatus wiped out. The second-named author has successfully used plugs of soft sealing-wax (Dennison's American Express, No. 2). After warming the stick over a flame, a bit of sufficient size is pressed off by the thumb and forefinger and inserted warm and

pliable in the external meatus. To make the adaptation more accurate the tragus is pressed over it for a moment, and for comfort the plug is then loosened a little at top and bottom by the index finger.

That the insomniac is to retire and rise at regular hours goes without saying. The proper preparation for sleep has already been alluded to. In some instances the change of the daily rectal evacuation from the morning to the evening is of assistance, the feeling of comfort and slight lassitude that follows defæcation conducing to slumber. In addition to what has been said of the sleeping apartment, I should like to insist upon the general advisability of single rooms and closed doors. More than once, in my experience, has removal of the wife or mother from a common chamber added one to three hours to her sleeping-time. Some neurasthenics and hysterics —generally those with partial or outspoken agoraphobia—cannot endure this nocturnal seclusion; a good many more say they cannot. For these latter a trial or two under the positive command and assurance of the physician will generally demonstrate the feasibility of the plan and materially hasten recovery. For the former, more refractory cases, a system of gradual removal must be followed, but I have never failed to accomplish it and to note the good effect. For the cases in which "imperative thinking" is the immediate obstacle to sleep one of the many monotonous mental pre-occupations may be of use. Thinking continuously of—

> "A flock of sheep that leisurely pass by,
> One after one; the sound of rain and bees,
> Murmuring; the fall of rivers, winds and seas,
> Smooth fields, white sheets of water, and pure skies."

Repeating prayers or poems over and over, the latter in the inverse order of the stanzas; recalling all the points of interest along a familiar journey, or the objects along a drive; reviewing all the characters in one of Dickens' novels or some other lengthy tale: these are a few examples. But this expedient is of little avail in cases other than those mentioned, where one idea or conception constantly obtrudes itself.

As a sleep-producing ally, the value of *hydrotherapy* can scarcely be over-estimated. The theories as to the how and why of its good results in functional nervous disease are exceedingly elusive: the results themselves are sufficiently substantial and cannot be too emphatically insisted upon. Of the different hydriatric procedures none stands *facile princeps*. Even for an individual case the best may have to be determined by trial, and a change from one kind of application to another is often of advantage.

The masterly article by Dr. Simon Baruch in Volume I. of this

SYSTEM cannot be improved upon, and I have no desire to reiterate his valuable words, even in part. Nevertheless, a few direct hints from my own experience may not be entirely superfluous.

For the immediate induction of sleep the warm or hot bath is the most generally useful. The patient should be immersed to the neck, or at least to the axillæ, with a cold cloth or turban about the head, and the duration may be from ten minutes to one hour; the shorter time for prostrated cases, the longer for robust and very restless ones. I like to close the bath with a dash of cold water or a quick rub (ten seconds) with a cold sponge. But some patients are made more wakeful by the hot bath. For these the cool half-bath (see directions by Baruch), a tepid sponge, or warm douche should be tried. Occasionally a nervous, over-active man is wonderfully quieted by a cold sponge, douche, or shower, followed by vigorous rubbing. The wet pack (see article by Baruch) is perhaps quite as efficient a sedative as the hot bath. In states of extreme agitation I think it even more valuable, but for ordinary nervous persons the rather elaborate procedure is sometimes discomposing and defeats the object. The hot abdominal compress has received the highest praise as a somnifacient, as has also Chapman's spinal ice-bag. I have had no personal experience with them, and while not wishing to decry their inherent merit, I am inclined to attribute much of their virtue to the mental impression, exactly as in the case of the midnight placebo presently to be mentioned. In the general physical and mental treatment of the patient I esteem particularly the matutinal cold sponge, cold douche, or sheet rub. The winter season is a contraindication for none of these. The sponge should be brief and followed by vigorous friction, preferably by a second person. For the douche, in the absence of special equipment, a couple of good-sized pitchers may be used and the water poured from a height over the back, chest, extremities, and occasionally on the head also. A more pronounced effect may be attained by alternating hot and cold water. The sheet rub may be used for patients who are physically robust and for those who are so weak that they can scarcely stand while it is given. I prefer to call it a sheet rub rather than dripping sheet, because in my opinion the "rub" is a much more important factor than the "drip." To the directions given by Baruch I would venture to add the following suggestions:

I dispense with the tub of warm water for the patient to stand in, as it is unnecessary and interferes with quick work. The preparations are all made at the bedside or, if need be, in an adjoining bath-room. A pail or small tub half full of water, to which I generally add a handful of salt; a large, strong, dry sheet, gathered up in folds lengthwise, and laid across the back of a chair so that it can be

grasped at one end and spread out between the two hands in a twinkling; a similar sheet, similarly folded, dropped endwise into the pail of water, with the protruding gathered end resting on the edge of the pail or grasped in the left hand of the attendant; a vigorous, intelligent attendant (two are better) with good "wind:" these are the provisions. The patient (quite nude) rises promptly from the warm bed, stands in front of the rubber with his back toward him and the arms flat along the sides. The attendant quickly draws the sheet from the pail through the half-closed right hand, which frees it of superfluous water, grasps the right upper corner with the right hand and with almost one movement draws the two corners apart, so that the sheet hangs a suspended screen between himself and the patient, and throws it around the latter. The lower part of the sheet will not envelop the lower extremities perfectly, so the attendant quickly steps to the side or front of the patient, draws the edges more completely around and gets the upper corner over the shoulder, where a slap will fasten it. He then fleetly rubs the patient all over, attending simultaneously to front and back, or to right and left, with either hand. The wet sheet is then snatched off, the dry one substituted and the rubbing resumed. As soon as dry the patient gets into bed, and the feet are briskly rubbed for a moment with a dry towel.

The whole procedure, except drying the feet, need not occupy more than one minute and a quarter—it must not consume more than two minutes; and if the rubber be not quite out of breath his work has not been properly done. Tepid or even warm water may be used for the first rub, but the temperature is to be lowered day by day until at the end of four to eight days it is quite cool or cold. The patient should *react at once* and feel a warm glow and general sense of comfort and well-being. Any shivering or depression after getting into bed is evidence of a defect in the administration of the treatment.

Among the more recent helps in general treatment kola may find a place. It should not be forgotten for a moment that it is only a temporary prop, not a true constructive, but it may enable the patient to take sufficient exercise and food for reconstruction. For instance, I have several times been able to get a weak and timid woman on to a wheel by means of the drug, when I could not without it. It is a cerebral exhilarant and I am unable to tell how much of its good effect is due to increased courage and confidence.

Passing again to the more direct treatment of insomnia, the timely administration of nourishment may first be mentioned. For many neurasthenics the evening meal seems to be insufficient fuel for the comparatively long interval between this repast and breakfast. A light meal at bed-time is a pleasant and efficient remedy for a large

proportion of these. Any easily digested aliment is appropriate for this purpose; hot milk and dry bread, bouillon and crackers, hot malted milk or malted meat, oyster-broth, raw oysters, koumyss and matzoon may be mentioned. Some of these patients get to sleep with little trouble or with the assistance of one of the aids already noted, but awaken soon after midnight with a feeling of weakness and prostration, sometimes with absolute hunger; and perspiration is not rare. Under these circumstances the light meal is to be taken at this time. At either time the addition of a modicum of some alcoholic will aid in producing the desired effect. Hot milk-punch, beer, porter, mulled wine, hot toddy, a glass of sherry, are all available, but these adjuvants are always to be used with circumspection.

There is quite a different class of poor sleepers who regularly awaken at twelve or one or two o'clock and are then unable to sleep for a longer or shorter time. They are generally the neurotics—the hysterical or habit insomniacs. Each individual has his personal waking-time and observes it with considerable accuracy. To prescribe with minute detail and quiet assurance a placebo to be taken at the moment of waking is an easy means of bringing sleep to many of these patients. But the remedy must be ready at hand and taken promptly. If it be somewhat disagreeable its efficacy is possibly enhanced, and the suggestion of Folsom, a small amount of paraldehyde in chloroform-water, is a good one, or a little volatile oil dropped into hot water and inhaled may be used. I have used a mixture of compounds spirits of ether and tincture of nux vomica with excellent results. In this connection it may not be amiss to recall that deep and rather rapid respiration has of itself a tranquillizing effect, even to the extent of anæsthesia. If necessary, the placebo may be repeated several times in the night, but it must not be overworked. It is not to be supposed that all periodical wakers may be cured by this treatment. There are other causes for this type of insomnia (see toxic cases and malaria), and this type of neurotic patient is affected with other kinds of insomnia.

It may not be entirely gratuitous to suggest that along with other organs the eye should receive adequate attention. That astigmatism, and probably eye-strain from other ocular defects, may cause sleeplessness is beyond doubt. It is equally true that the inability to sleep may be the only, or at least, the most obtrusive derangement due to the eye-trouble, but it is unlikely that such insomnia would occur in a healthy individual. Given a neurasthenic, the disturbing influence of an error of refraction may serve to prevent sleep, just as may the pulse in the ears or some trivial occurrence of the day that normally excites no reaction. The moral is obvious: Correct the ocular abnormity, but do not stop at that.

The proper place of *electricity* in the treatment of insomnia is still undetermined. That it is sometimes of assistance cannot be questioned, but in analyzing this result it seems impossible to tell how much is due to mental impression and how much to the effect of the current itself on the brain tissue. The obscurity of its *modus operandi* is no cause for rejecting it as a therapeutic agent. Of the three currents, the faradic, galvanic, and static, the first is, as a rule, to be rejected. Passage of the galvanic current from the forehead to the nape of the neck, or *vice versâ*, undoubtedly induces drowsiness in some persons, and they sleep the better for it. The electrodes should be very large and easily moulded to the parts, the current turned on and off gradually by means of a suitable rheostat, and its strength should not exceed 15 to 20 milliampères. I am in favor of rather lengthy sittings (ten to twenty minutes), prolonged if possible until there is a distinct feeling of drowsiness. The later in the day the application is made, the better. The static breeze or bath is somewhat more effective as a hypnotic than the galvanic current. It may be used every day for ten minutes, preferably in the afternoon or evening. Care should be taken to avoid the passage of sparks between the electrode and the head of the patient, as they are exceedingly disagreeable and the shock generally neutralizes the good produced by the breeze. The effect of electricity on sleep is largely a matter of experiment in each case, although in neurasthenia and hysteria it is well to assure the patient beforehand of good results; at least, to make a positive statement as to its benign influence in some cases. The writer feels it incumbent upon him to say, however, that careful observation and some few deliberate experiments on patients have forced him to the conclusion that the greater part of the good effect of galvanization of the brain and of the static breeze is due to their psychic effects—to suggestion, if that term be preferred. But, as before stated, that does not in the least militate against their employment if they will close the eyes of a sleep-wanting patient. Rather should it show that the means is always to be supplemented by the conduct of the physician, which need not be that of an unbalanced enthusiast, but such as will aid in tranquillizing and reassuring the sufferer.

At this juncture, perhaps, some mention should be made of the vibrating helmet (*casque vibrant*) of Gilles de la Tourette. It is a metal helmet, easily adjusted to the head, and surmounted by a diminutive electric motor, to which a small eccentric wheel is attached. The motor is run by a suitable battery, and the rapid revolution of the eccentric communicates a not unpleasant vibration to the helmet, and hence to the head. In my hands (and in the hands of others) it has proved to be of some assistance in relieving the distressing head-symptoms of neurasthenia and in promoting sleep.

Hypnotism should not be utterly discarded in the treatment of insomnia. Its field of usefulness is very restricted, but there is occasionally an hysterical patient, sleepless, nervous, agitated, perhaps apprehensive, whose stomach rejects drugs or in whom they act badly, who may be quickly tranquillized and put to sleep by this means. There are others who have already taken hypnotics to excess and cannot, or think they cannot, sleep without them. In these, hypnotism is of occasional assistance in tiding the patient over the difficult passage between abnormal and normal sleep habits. In any event, hypnotism is to be regarded, not as a system of treatment, but as an improvised stepping-stone to better things. It is always to be used simply, in a matter-of-fact way, without any assumption of mystery or peculiar power or personal influence. Employed with these common-sense precautions, I have never known it to do harm. To avoid any possible misapprehension I add, in so many words, my opinion that in scarcely one case of insomnia in a hundred is hypnotic treatment indicated; in the one-hundred-and-first case it may be the remedy *par excellence*.

The use of somnifacient drugs in the treatment of neurasthenia and hysteria is to be broadly condemned. Their employment is sometimes inevitable, but in the following, as well as the preceding, lines it is intended to point out their restrictions fully as definitely as their indications. In the administration of sleep-producing medicines three principles may be assumed as premises:

1. Never to resort to drugs until other measures have failed.

2. Other means having been exhausted, to be satisfied with the least amount of sleep compatible with health.

3. To use the smallest dose of the remedy that will accomplish the object.

Each of these propositions needs some comment and qualification.

In treating the almost absolute insomnia sometimes caused by great mental shock or moral perturbation, especially if it occur, as is apt to be the case, in a person with neuropathic tendency, it is inadvisable to lose time in an essay with milder remedies. Full doses of hypnotics should be given at once to conserve the vitality of the patient and avert possible mental alienation. This is one of the few instances in which insensibility is desired, even if it only remotely approach natural sleep. The best drugs for the purpose are chloral, trional, sulphonal, or, if need be, the hypodermic injection of hydrobromate of hyoscine, $\frac{1}{100}$ of a grain. Sulphonal is well adapted to this purpose, as its action is prolonged through the day. It should always be given with hot milk and never too frequently. If trional or chloral is used, a full dose may be given shortly before bed-time and then supplemented by bromide during the day (20 to 60 grains t. i. d.).

The plan of giving comparatively large doses of hypnotics for a few days in ordinary neurasthenia, hysteria, or hypochondria has been already alluded to.

Insomnia of the puerperium, infection as a cause being excluded, should be treated in the same vigorous manner.

In its practical application, the second proposition involves a knowledge of how much the patient sleeps, and, as before intimated, investigation may show, contrary to his belief, that the hours of slumber are but slightly curtailed. That is, the disorder of sleep is qualitative and not quantitative: a form of disorder that does not come under the head of insomnia and is but little adapted to medicinal treatment. The less drugs are used in such cases the better. Supposing the duration of sleep to be unnaturally short, still, if the patient be reasonably recuperated, if by the general treatment he can be made to gain ground on this presumably insufficient sleep, it is best to let drugs alone. Having been driven to the use of medicines, that the smallest useful amount is to be given would seem to go without saying. But I am perfectly convinced that it is much better in the beginning to boldly give a thoroughly effective dose than to temporize with only partially efficient medication. This applies particularly to the insomnia of neurasthenia and hysteria, in which the psychic element plays such an important part. To administer in these troubles the rather customary 5 grains each of bromide and chloral three times daily would be absurd, if it were nothing more reprehensible.

Approaching now the symptomatic treatment of insomnia, let it be remembered first that, broadly speaking, symptomatic treatment is always a time-serving expedient or a contribution to euthanasia; and second, that there are several kinds of insomnia. It may be added that there is not a single hypnotic that can be for a long time effective, harmless, and without unpleasant by-effects. This implies that when the prolonged administration of hypnotics is unavoidable a frequent change in the remedy is advisable. In every instance in which a single dose is given its administration should be so timed as to aid the organism when it is already moving sleepward.

For the insomnia of a too active mental state—for the man whose thoughts run riot when he wants to sleep, but who is not really nervously prostrated—bromide is probably the best remedy. It should not be given in a single dose at bed-time, but in divided doses (15 to 30 grains each) through the day. The same treatment, modified, is applicable to the occasional patient who must be tided over a few days of great strain or excitement. In such emergency cases the bromide may be supplemented by a dose of kola in the morning and at noon (wine of coca answers the same purpose), and 20 to 30 grains

of chloral or 15 to 20 grains of trional before bed-time. In the insomnia of an overworked brain, in addition to food and stimulants already alluded to, turpentine is often useful.

The habit, psychic, apprehension insomnia of the neuropathic individual is generally much easier to overcome than that of the true neurasthenic. The latter sometimes resists even heroic doses. An alcoholic stimulant or digitalis is then of advantage, combined with trional, sulphonal, paraldehyde, or chloral. Although sleep is easier procured for the neuropath the relief is much less likely to be lasting, and frequent changes and combinations of drugs are necessary. Chloral should be used but little, morphine never. Trional, paraldehyde, sulphonal, chloralose, chloralamid, are probably the best. Small doses of compound spirits of ether and chloroform, to be taken on waking at night, should be mentioned. Any of the drugs enumerated at the close of this section may be tried.

The selection of a remedy should be made somewhat with reference to the time of wakefulness. If the insomnia be distributed at shorter or longer periods throughout the night, a rather mild but continuous action is desirable. For this, bromides through the day, sulphonal two or three hours before bed-time, paraldehyde, trional, or chloral one-half hour before retiring, or chloralose at bed-time, may be used. Should the patient go to sleep with reasonable promptness but waken too early, it will usually be found that the hour of awaking varies but little. Administration of the remedy may be timed accordingly, and for this purpose sulphonal is admirably adapted. Given at bed-time, with an abundance of hot liquid, it begins to act in one and a half to two hours, and its maximum effect is reached in three or four hours. Taken with cold liquid its action is still longer deferred and slower, but less certain. The other hypnotics may be used for this type of insomnia, but the dose must be relatively large. When the difficulty lies in failure to fall asleep on retiring, the hypnotic must be given early: sulphonal four hours, the other drugs one to two hours, before bed-time.

On occasion, any of the following hypnotics may be employed, and it should be remembered that one may be successful when others have failed.

Trional, in doses of 10 to 30 grains, may be repeated every four hours until several doses are taken. Five-grain doses are sometimes effective. It is almost tasteless, not very soluble, not a circulatory or respiratory depressant, and ill effects are quite infrequent. It may, however, cause nausea, vertigo, headache, slight inco-ordination, tinnitus aurium, and unpleasant diaphoresis.

Sulphonal is very sparingly soluble, even in hot fluids, and consequently acts very slowly. It should be administered in or with a

glass of hot milk, which prevents the production of hæmatoporphyrinuria, otherwise sometimes caused by it. On account of its insolubility, prolonged action, and occasional unpleasant effects, frequent doses are to be avoided. Often a single dose every second day is sufficient. An uncomfortable heavy and dull feeling, unsteady gait, nausea or even vomiting, and headache are to be mentioned as possible after-effects.

Chloralamid, in doses of 20 to 50 grains, best given in acid solution, is an excellent soporific. It has the advantage of having a slightly anodyne action, and is thus useful in the late stage of sciatica, neuralgia, muscular rheumatism, etc., when the acute pain has subsided and only a nervous state with some local aching or soreness remains. It is not so reliable in its action as the two preceding drugs.

Paraldehyde, on account of its almost purely hypnotic effect, absence of danger, and minimum ill effects, is a desirable remedy. But the taste is so exceedingly disagreeable and the repulsive odor so clinging that most patients object to its use. It is, besides, an irritant to the respiratory tract. The dose is 20 minims to 1 drachm.

Chloralose is highly praised by those who have used it extensively. The sleep induced seems to be natural, and disagreeable sensations on waking the exception. In a few instances a large dose has caused rather alarming symptoms, the patient apparently going into collapse, but this has proved to be without danger and can be avoided by careful administration of the drug. Three grains may be given as an initial dose, and seven grains should not be exceeded.

Urethan (dose 10 to 20 grains) is a mild hypnotic, devoid of danger, with nothing in particular to commend it except that it may on occasion be used as a change.

Amyl-hydrate : A colorless oily liquid, of which the dose is from 30 minims to 1 drachm ; the unpleasant sequelæ are trifling.

Somnal, hypnone, hypnal and chlorobrom have all been very successful in the hands of competent observers. The writer has had no personal experience with them. The first may be given in doses of 1 drachm to 100 grains, but it is apt to aggravate any existing gastric or intestinal trouble. The dose of the second is 1 drachm, and that of hypnal 15 grains. It is said that chlorobrom may be given for months without untoward effects. The dose is 2 drachms, to be gradually reduced or increased as necessity arises.

The Distresses of Sleep.

The disorders described under this title are not peculiar to hysteria and neurasthenia, but they are comparatively frequent as symptoms of these diseases and hence are here grouped together.

Dreams need no particular mention, except that they undoubtedly

do, in exceptional cases, have a very considerable influence in the genesis and perpetuation of nervous states. This is most often demonstrable in cases of traumatic hysteria, or nervousness following a definite mental shock. The same intense dream, repeated over and over, makes an impression that is carried on into the waking state, although this influence may be subconscious—unnoticed by the patient. An interesting peculiarity of these visions, in such cases as are accompanied by hemianæsthesia and unilateral amblyopia, is that the figures and persons of the dream uniformly first appear on the side corresponding to the amblyopic eye, and pass across the visual field to disappear on the other side.

Night-terror is rare in adults. Mild cases are simply accentuated nightmare, with, perhaps, the element of somnambulism added. Typical cases, however, are something more, and seem to constitute a unique central neurosis. The only case that has come under the personal observation of the writer had resisted all manner of symptomatic treatment, but the patient was dissipated and good general measures were impossible. His attacks were nightly, and I took occasion to observe one. Without premonition, he sat up in bed (sometimes he would spring out of bed) with wide-open eyes and the most terror-stricken expression it has ever been my lot to see. At the same time he gripped the bed with both hands and gave utterance to the most piercing shrieks. The whole was unlike anything I have ever seen in an adult, but impressed me as being possibly a form of epilepsy. Bromide, however, gave no relief.

Muscular cramp is not rare in sleep, and, besides neurasthenia and hysteria, has a multi-pathologic basis. Among the causes may be mentioned physical fatigue, the various toxæmias, arterio-sclerosis, gout, rheumatism, diabetes, chronic nephritis, lithæmia, sciatica (especially the neuritic form), varicose veins, and convalescence from acute disease. The treatment must be that of the causative condition: for the neurotic form, full doses of bromide. Immediate relief of the cramp is best obtained by stepping at once on to a piece of cold oil-cloth or sheet-iron.

Nocturnal pruritis may be a very plague. Besides diathetic treatment, chloride of calcium, 20 to 30 grains, well diluted, two or three times a day after meals, should be tried. For nocturnal burning of the feet a rubber bag of ice-water is worthy of trial.

The subject of painful awakening is treated in the following section, although the disturbance is apparently caused, in many instances, by some distressing impression received or developed in sleep. A consideration of night-palsy or night-numbness has also been transferred to that section, although the condition undoubtedly develops before the patient awakes.

Disorders of Sleep peculiar to the Transition State between Waking and Sleeping.

There is a host of nervous disturbances restricted to the time between the waking and sleeping states—the *pre-dormitium* and *post-dormitium* of Weir Mitchell—that belong especially to neurasthenia and hysteria, without being confined to them.

In the quiet moments before sleep comes, many sensations that are imperceptible or easily neglected during the day obtrude themselves on consciousness. Tinnitus aurium and the aural pulse are among the most frequent of these. An intense appreciation of the presence of the extremities or of the internal organs is a daily complaint. Visual sensations that are only an accentuation of the play of colors that any person can see on closing the eyes, annoy other patients. Muscular starts at the moment of dropping off, a sensation as though the head were expanding, a feeling of bodily weight as of lead, or of gaseous lightness, are common. If the last be a little more pronounced the patient feels as if he were floating off into space or as if the bed were sinking from under him. Presenting some analogy to the sudden motor discharges (which may attain to even a violent degree) are what I would call psychic starts. The patient is just losing himself when he suddenly regains vivid consciousness with an impression of impending death or simply an intense feeling of apprehension. A similar disturbance is later described as pertaining to the post-dormitium, while imperative conceptions and fixed ideas as sleep preventives have already been mentioned. Akin to these are presomnic hallucinations, which are not rare, as every healthy adult can probably recall instances in his own experience. They are even said to be, at times, a family trait, but are nevertheless of importance as a possible indication of intoxication by alcohol or tobacco or of an incipient psychosis. These hallucinations are quite distinct from certain sensory discharges or sudden and distressing subjective sensations that have a predilection for the same antedormal state. They appertain most frequently to the auditory sphere, but may relate to any other of the special senses, to several combined, or to none specifically. Two examples will illustrate: A gentleman of twenty-nine, a typical neurasthenic from neuropathic heredity and prolonged worry, was just falling asleep when he was startled by an apparent explosion in his head. He insists that there was a coincident flash of light, and that the explosion was exactly like the discharge of a pistol—and in the head, not near by. The phenomenon frightened him exceedingly; he started up in bed and it was some minutes before he could again compose himself. The attack was not repeated.

A lady of forty years, nervously and physically exhausted by

manifold cares added to a nervous disposition, was seated, preparing for bed, when, so far as her sensation was concerned, she received a crushing blow on the back of the head. With a cry she sank to the floor, did not lose consciousness, but immediately felt a peculiar, subjective vertigo. Her husband picked her up and placed her in bed, where she found that she could lie only on the left side, any attempt to change this position resulting in the indescribable cephalic distress that seemed to be more like vertigo than anything else. About thirty minutes later I found her lying upon the left side, quiet and comfortable, but very apprehensive. She was positive that should she turn over the disagreeable sensation in the head would return. After a few moments, however, she slowly did so without discomfort. A most careful examination failed to reveal any grounds for supposing the presence of an organic lesion. She has since then (seven years) had no return of the violent stroke, but what she now calls the "silent whirr" is very apt to be felt when she is tired out. It will be noticed that the sensory shock, in this instance, did not take place, strictly speaking, in the pre-dormitium, although the subsequent slighter manifestations have been practically confined to that time. As a matter of fact the symptom may occur during the day, though it rarely does so.

Sometimes the sensation is likened to the sound of a gong or the twang of a harp-string, and when the attacks become habitual there is not rarely an aura, in which case the patient may be able to abort the attack by turning over or sitting up as soon as the aura gives him warning. It is characteristic of the somnolent state during which these peculiar symptoms generally arise, that the patients find great difficulty in thus breaking in on the attack and jugulating it. But this ability may be and should be acquired by practice, and the idea should even be cultivated during the day, to make its execution at night the easier, for systematic interruption of the train of symptoms is one of the best cures.

Disturbed awakings are of various kinds. Many poor sleepers, and many nervous or worried persons who sleep well, awake unrefreshed and complain that they are more fatigued than when they retired.

Separate mention should be made of a particularly distressing group of sensations that are felt on waking—and probably cause the cessation of sleep—as they are not infrequently mistaken for an indication of organic disease or of nocturnal epilepsy. The patient regains consciousness rather suddenly, with a sense of oppression and impending danger, accompanied by palpitation, præcordial distress, cold perspiration, and a feeling of trembling which may be local or generalized. One or more of these separate elements may be absent. Patients, as a rule, mention a shaking or quivering, but in my experience inves-

tigation has generally shown the symptom to be purely subjective. This painful waking is apt to occur very early in the morning (two to four o'clock), and it should be said that the patient usually has no knowledge of nightmare or a horrifying dream as producing it, although it is not unlikely that such cause or accompaniment is present. So far as I am able to judge, the symptom is more frequent in neuroses due to injury or shock. For instance, of five recent cases, two were directly referable to fear of hydrophobia, following dog-bite; one followed an operation on the perineum and vagina; one was caused by a street-car accident; and the last, the exception to the rule, occurred in a young married man who worried incessantly because he was out of work and money. Freud has written of these agitated awakings as a part of his "anxiety neurosis," the etiology of which he believes is always to be found in some sexual irregularity, but the symptom certainly is not confined to neuroses of this origin.

Quite a distinct set of symptoms has been variously described as nocturnal hemiplegia, night-numbness, night-palsy, nocturnal monoplegia, and sleep-pain. The character of the trouble is sufficiently well indicated by the titles. The patient awakes to find himself the victim of a tingling and numbness (sometimes rather a pain) associated or not with transient loss of power. As described by Ormerod the disturbance attacks predominantly the upper extremities, affects principally women at the menopause, and in particular needle-women, scrubbers, and others who labor with the hands. This is the common type. The symptom may appear in persons hemiplegic from cerebral apoplexy and be confined to the paralytic side. But apparently vigorous subjects are not exempt, and its distribution is governed by no known rule. A peculiar form is that which affects the legs from the feet to the knees, is not a distinct pain but rather an acute distress, and begets an imperious desire to move and stamp the feet. Although it generally occurs in sleep and may waken the patient several times in the night I have known it to be almost confined to the pre-dormitium.

True night-palsy and night-numbness are important largely on account of their innocuousness. Occurring in the subject of organic hemiplegia, or indeed in any person, they are certain to awaken apprehension of apoplexy or other paralysis, and it is no trifling matter to be able to give assurance of their benign character—unpleasant though they be. But such reassurance should be given only after a positive diagnosis and the careful exclusion of organic disease. The symptom may occur as a prodrome of multiple neuritis, preceding the pain by several days. A verisimilitude of the hemiplegic or monoplegic form may be presented by the sensory type of Jacksonian epilepsy, which consists of transitory numbness, tingling or other paræsthesia, followed or not by weakness of the affected part,

but unaccompanied by spasm. Such attacks of focal epilepsy are due to organic brain-disease, and may, of course, occur at night, but I have never known of a case in which the fits were only nocturnal.

Weir Mitchell relates the instructive case of a physician who, being himself a sufferer from the functional form of nocturnal hemiplegia, confidently assured a patient who came to him with waking numbness that the trouble was nothing serious. The latter, unfortunately, was diabetic and his attacks of paræsthesia were the precursor of gangrene.

Transitory attacks of numbness, with or without weakness, are not infrequently due to degeneration of the arteries of the brain, and are well known as premonitory signs of cerebral thrombosis. I have known night-numbness of the legs to be closely simulated by syphilitic periostitis of both tibiæ, and an uncontrollable restlessness of the lower extremities, manifested especially after retiring, is not so very rare in locomotor ataxia.

The symptomatic treatment of these disorders connected with going to sleep and waking is not very successful. Occasionally hypnotics to enable the patient to sleep promptly and soundly are of some assistance, but the chief reliance must be placed on general treatment. When they are due to the toxæmia of intestinal derangement, lithæmia, gout, alcohol, or tobacco, which is not rarely the case, permanent removal of the intoxicant affords relief.

DISORDERS OF SLEEP IN MENTAL DISEASE.

Among the insane, by far the most important disorder of sleep is the lack of it. The numerous illusions and hallucinations born of sleep and the night, and the delusions to which they give rise, need not be considered here.

Respecting insomnia as a cause of insanity, an opinion has already been expressed. The possibility need not be denied, neither is there any reason why a neurasthenic insomniac may not become insane, but that the insomnia plays an important rôle in the causation is highly improbable. In fact, the majority of such cases will be found to have been examples of psychic alienation from the first, and the caution not to mistake an incipient psychosis for "nervous prostration" cannot be too often repeated. In some instances the insomnolence seems to be the only symptom of note until a sudden tragedy awakens friends and physician to the fact that a grave condition has been overlooked. This is not the place to consider the differential diagnosis between insanity and neurasthenia, but it may not be amiss to say that when

the patient exhibits marked *tedium vitæ*, loss of interest in usually engaging subjects, and lack of affection for beloved relatives, especially if he be non-communicative and courts solitude, melancholia should be strongly suspected. The appearance of any form of delusion, of very extravagant conduct, or of a few unmistakable somatic signs, takes the case at once out of the realm of nervous prostration. Marked insomnia without apparent cause or appearing and disappearing without relation to other symptoms, particularly in a person with an hereditary tendency to insanity, should put the observer on his guard.

The proper treatment of the insomnia of insanity is a vexed question, but it will be conceded at once that in its incipiency it should receive prompt and careful attention. Although, in my opinion, the wakefulness cannot be regarded as preceding the psychosis, but is rather to be considered as an early manifestation of the disease itself, yet the symptomatic treatment of the insomnia may be thoroughly successful because it is, incidentally, the best treatment for the mental state. To illustrate: We eat, symptomatically, to quiet hunger; physiologically, we eat to provide material for bodily repair and growth: we know that this material has been furnished when hunger ceases, when the appetite sleeps. In other words, if, in this early stage, a sufficiency of refreshing sleep may be procured the attack of insanity may be averted or checked in its inception. The best means of attaining this end may require a nice judgment. All of the general aids enumerated as of value in neurasthenia are applicable here. Particularly are a sufficiency of out-door exercise and appropriate food, quiet seclusion, the hot bath and wet pack, to be commended. Of the soporific drugs, trional, sulphonal, chloral, paraldehyde, or one of the others already enumerated may be used—never forgetting that chloral is a cardiac depressant. In incipient or mild melancholia I do not hesitate to give opium, and although the results are not always gratifying I find it one of the best drugs for this disease, and in doses up to 3 grains three times a day have never seen any ill effects from it. It should ordinarily be withdrawn gradually, although in a few instances stopping it abruptly and substituting full doses of bromide, as is done in the Flechsig treatment of epilepsy, has occasioned only good results.

In severer cases of melancholia, in acute mania, the excited stage of general paralysis, and the like, it is difficult to determine to what extent sedatives should be used. There can be no doubt that a few full doses in the beginning sometimes accomplish a great good. For acute mania the hypodermic administration of $\frac{1}{100}$ grain, or even $\frac{1}{50}$ grain, of the hydrobromate of hyoscine is probably the best remedy, but it has a depressing action on the heart. The same may be used in the other psychoses, although it has no special advantage and

sulphonal, trional, paraldehyde, and chloral are better; the bromides, even in drachm doses, have but little effect. Later the dosage should be regulated by its effect. Insensibility is not sleep, and the condition of the patient before and after the action of the soporific should be carefully compared. Sometimes he is better off to lie awake for days together than to take the doses of medicine necessary to force him into unconsciousness. Neither should it be forgotten that even when a sedative drug causes no perceptible impairment of the vitality, no depression of the circulation or respiration, no derangement of digestion, it may still produce considerable mental depression. In spite of the prospect of a good night's rest being shattered the patient will sometimes request that the sleeping-powder be omitted on account of the oppression of the spirits following its use.

The employment of hypnotics in insanity may be broadly summarized as follows: Early in the disease they may be given rather freely, later with caution, and in the last stages they should be entirely withdrawn in favor of more general measures.

DISORDERS OF SLEEP FROM INTOXICATION.

Alcohol and tobacco are the principal intoxicants producing disorders of sleep, although similar derangements may be caused by lead, mercury, bisulphide of carbon, tea, coffee, and the various drug habits. The auto-intoxication of disease is not separately considered.

Loss of sleep, or disturbed sleep, is frequently the first symptom of alcoholism. Terrifying dreams, or hallucinations at the moment of falling asleep, are well known as belonging to the early stage of delirium tremens. Of the fully developed affection, wakefulness is a prominent symptom and as soon as the patient can sleep and eat convalescence may be considered as inaugurated. In cases of only moderate severity, full doses of bromide (30 to 60 grains) with nux vomica, three times daily, may be quite sufficient to induce sleep and avert a serious attack. But even in the mildest cases the state of the heart must be accurately known, as sudden cardiac failure is always possible. The graver the case, the more urgent is the precaution, and no hypnotic is to be employed at the expense of the patient's powers. For this reason large doses of chloral are rarely indicated. Trional, paraldehyde, chloralamid or sulphonal are preferable. Even with these it is often advantageous to combine strychnine, digitalis, or nitro-glycerin. In delirium tremens, as in the severer cases of insanity, it is sometimes wiser to allow the patient to go without sleep than to give him the heroic doses necessary to compel it.

Treatment of the insomnia of chronic alcoholism, unattended by delirium, means the treatment of the vicious habit, but temporary relief is not difficult. Bromide and strychnine three times a day, trional, and sulphonal act well. The addition of capsicum to the hypnotic and to animal food given at bed-time is of advantage. It is well to remember that a gastric mucous membrane coated with viscid secretion and accustomed to the irritation of raw spirits may be only agreeably stimulated by a dose of red pepper that would be instantly rejected by a more sensitive stomach.

Tobacco is not only a frequent cause of insomnia, but is one of the most influential factors in the production of disturbances peculiar to falling asleep and awaking. The insomnia of tobacco (and also that of alcohol) is apt to take the form of early waking, but not quite so early as that of the neurotic individual before described. The latter usually comes on soon after midnight, toxic insomnia about two hours later, although there is nothing absolute about this rule. At any rate, in every case of insomnia, whatever the type, tobacco should be thought of as a possible cause. The treatment is simple and uniformly successful; withdrawal of the cause, full doses of strychnine, and mild hypnotics for a time. Hot toddy at bed-time is an efficient aid, but should be used with care lest one bad habit be substituted for another.

It may be noted that insomnia and other nervous symptoms of an intoxicant may appear only when the individual has interrupted its use because of conscientious scruples or some bodily indisposition, has become neurasthenic from other causes, or has sustained some physical injury from accident or disease. Under these circumstances the toxic agent as an important part of the etiology may be overlooked.

DISORDERS OF SLEEP IN ACUTE DISEASE.

THE treatment of insomnia in acute disease must rest upon the principles already indicated. The best treatment of the sleeplessness is always the treatment of the disease. Although sleep is the great restorer, and is to be procured whenever expedient, it is not to be forced upon the patient at the expense of his vitality. In dealing with acute diseases, which are nearly all self-limited, the formation of drug-habits and the acquisition of drug-tolerance are not primary considerations. The question of cardiac and respiratory depression is of vital importance. In the early stage of pneumonia, for instance, when the pulse is strong and the patient vigorous, persistent insomnia may be overcome by venesection or aconite. If preferred, trional,

chloral, or sufficient doses of morphine may be given, all to the permanent benefit of the patient. But in a later stage, when the patient is exhausted, the pulse flagging, and the respiratory centre necessarily kept up to the highest possible activity, a depressant of any kind would mean death. At such a time, chloral and opium are to be classed with venesection and aconite and religiously avoided. Trional, chloralamid and paraldehyde are not so objectionable, but are to be used with extreme caution. Digitalis, strychnine, alcoholic stimulants, are the remedies indicated to induce sleep. For the wakefulness of pleurisy, morphine and aspiration are probably the best remedies.

The insomnia of typhoid fever is deserving of grave consideration, and the medical attendant should always know when and to what extent wakefulness is present. Early in the disease it undermines the vitality and makes the subject less resistant to the later drains of the disease. In the advanced stages it exhausts the patient, and may prevent enough daily recuperation to keep him alive. Incomparably the best treatment, for all stages alike, is hydrotherapy in one of the several forms so well described by Dr. Baruch in Volume I. of this SYSTEM. But reduction of temperature is not always followed by sleep, and the insomnia then demands symptomatic treatment. During the first week, or before secondary infection, bromide may be given in full doses or, what is better, chloral hydrate, which at this time is not objectionable and is generally effective. Trional, sulphonal, chloralamid, may be tried but are rather uncertain; opium is to be avoided. Later in the disease trional and similar remedies are more reliable than in the beginning, and codeine ($\frac{1}{4}$ to $\frac{1}{2}$ grain) is an excellent hypnotic, but the best of all at this time is opium or morphine, which is sometimes greatly increased in its action by the addition of $\frac{1}{150}$ to $\frac{1}{100}$ grain of hydrobromate of hyoscine. When prostration is very great the free administration of stimulants is of value, and a hypodermic injection of sulphuric ether has been known to procure refreshing sleep when all else failed.

The treatment of insomnia in other acute diseases may be gathered from the following. In articular rheumatism, antipyrin and Dover's powder; in influenza, phenacetin or sulphonal; in the early stages of the exanthemata, antipyretics, trional, or other pure hypnotics, in the late stages $\frac{1}{5}$-grain doses of morphine unless voluntary effort is needed to keep the respiratory tract clear of mucus and saliva; for the vigil of meningitis, cold to the head and morphine, although full doses of trional may suffice. These are additional hints possibly worthy of mention.

Insomnia of the puerperium may be mentioned in this connection. If marked and not due merely to prostration or loss of blood, it is of grave import, as it then indicates either infection or impending puer-

peral insanity—possibly both. When accompanied by a feeling of well-being or exhilaration it is none the less foreboding. Infection having been excluded or properly treated, hypnotics may be administered even in large doses, for a short time. For this purpose sulphonal, trional, chloralamid, or full doses (1 drachm) of bromide may be used, and there are no objections to chloral (20 grains), or even morphine with atropine hypodermically, if necessary. When the wakefulness is due simply to the excitement attending parturition, as is not rarely the case with primiparæ, any mild hypnotic will answer the purpose. For the insomnia of prostration or acute anæmia the frequent administration of liquids, light food, and small quantities of stimulants is indicated. Half a drachm of Hoffman's anodyne in ice-water is an excellent remedy.

For the insomnia of convalescence the treatment is practically the same as that for anæmia and chlorosis: plenty of easily digested, nutritious food, mild alcoholic drinks in moderation, iron, strychnine, quinine, and other tonics are the best remedies. There is no objection to moderate doses of hypnotics if the heart and digestion do not suffer thereby. Trional, sulphonal, urethan, chloralamid, and compound spirits of ether may be mentioned. Ten grains of quinine at bedtime followed by whiskey in hot water is an excellent remedy, or Warburg's tincture may be tried without the whiskey.

DISORDERS OF SLEEP IN CHRONIC DISEASE.

THERE is scarcely a chronic disease that does not cause disorders of sleep, and in every instance the ideal treatment of the insomnia is the successful treatment of the causative disease. It would, therefore, be utterly futile to attempt a systematic discussion of the subject in this connection, and what follows is to be considered in the light of suggestions only.

Of 273 cases of insomnia in the practice of MacFarlane and two friends, 17, or one in sixteen, were due to "dyspepsia." If all forms of gastro-intestinal disease were taken into consideration this ratio would probably be greatly increased. However that may be, it is certain that insomnia or some other disorder of sleep may be a symptom of every variety of digestive derangement. It is equally true that loss of sleep not infrequently has a reciprocal action for evil on the digestive function, and that if the patient can be made to sleep, or taught to sleep, the trouble in the gastro-intestinal tract at once improves. There seems to be no doubt that protracted insomnia may be caused by indigestion without other signs of a deranged stomach.

Some of the cases of apparently simple sleeplessness are, I am convinced, due to intestinal auto-intoxication, while others have a twofold etiology—reflex disturbance from the stomach with the toxæmia added. Besides loss of sleep, abnormal somnolence, nightmare, muscular starts, and painful awakings are at times referable to disordered gastro-intestinal functions.

Regulation of the diet, particularly a light, easily digested evening meal, intestinal antisepsis, and good personal hygiene will generally overcome the difficulty. When there is undoubted irritation of the gastric mucous membrane, cocaine may be given for temporary relief. Not infrequently mild hypnotics may be required to break up the vicious sleep-habit.

Lithæmia, chronic rheumatism, and gout are prolific causes of sleep-disorders. The first especially is of importance, as it is so frequently unrecognized, and insomnia or any one of the other forms of disturbed sleep described under Neurasthenia and Hysteria may be the only symptom to which the patient calls the physician's attention. Even the ordinary gastric trouble and headache may be wanting. The wakefulness of lithæmia, like that of other toxæmias, affects especially the early morning hours. When the patient wakes at this time, a drachm each of Carlsbad salts and syrup of ginger in water will often produce immediate sleep. Dependence must be placed, however, on more general treatment. Restriction of meat and fats, with abundance of physical exercise, Turkish baths, mercurial and saline purges, enter into the accepted routine. Salicylate of sodium and muriate of ammonium are to be highly commended. When there is increased arterial tension potassium iodide, alkalies, and aconite are advisable. Lithæmia and gout play an important rôle in the "night-numbness" already described, and some cases are entirely cured by the measures just indicated.

It were unnecessary to say that manifold disorders of sleep may be caused by Bright's disease and diabetes, if they did not occasionally constitute the only notable symptom and thus mislead the diagnostician. The possibility of such an oversight needs but to be mentioned to be avoided. For the insomnia of chronic nephritis chloral is particularly good, as it causes dilatation of the vessels and so lowers arterial tension. Its action is enhanced by the addition of bromide and morphine. In the renal disease of the aged, nothing controls the insomnia so well as opium.

The first statement to be made in any consideration of the disorders of sleep due to disease of the circulatory system is that such disorders are never to be referred to "anæmia of the brain" and "congestion of the brain" in the sense in which these terms are most frequently used. That is, they are not due to changes in the cerebral circulation

as an essential condition—as a morbid entity. The insomnia following severe hæmorrhage is dependent on cerebral anæmia as a part of the general condition. The nightmare of mitral disease may be due to the overfilling of the cerebral veins, but this is not the supposititious condition usually indicated by the term "cerebral congestion." Above all, disorders of sleep are not caused by "congestion of the base of the brain," for the simple reason that such a condition does not exist, except possibly in the first stage of basilar meningitis.

Some patients are awakened in the night by violent palpitation. This may be purely nervous, caused by a distended stomach, or may depend on organic heart-disease. For all alike, a cold compress or an ice-coil to the præcordium is a good palliative. In some cases of cardiac disease not sufficiently severe to cause insomnia, the patient is troubled with nightmare or terrifying dreams unless a certain posture be maintained.

It is worthy of note that insomnia, with possibly some other nervous symptoms, may be the only manifestation of fatty heart. Ordinarily, however, although the patient may in no way complain of the heart, there is a history of irritable temper, occasional weakness, dizziness on exertion, cold feet, disagreeable dreams, and perhaps nocturnal dyspnœa. For this condition digitalis, strychnine, arsenic, and an occasional dose of morphine are indicated. Chloral is to be shunned as dangerous.

For the insomnia of valvular disease, bromide may be given when there is compensatory hypertrophy. When dilatation has supervened, digitalis and similar drugs, diffusible stimulants, nitro-glycerin, nitrite of sodium, etc., must be depended upon. For præcordial distress, the ice-coil or dry cups. In some cases, unloading the circulation by venesection will relieve the heart and allow of refreshing sleep. When the cardiac power is fairly good, opium may be cautiously given and sometimes acts like a charm. If orthopnœa be present, hypnotics are out of the question. In all cases the amount of urea excreted should be estimated; if found deficient, free purgation may at once relieve the insomnia.

Insomnia and other disorders of sleep in chronic respiratory affections are due to cough, passive congestion, fever, or the accompanying anæmia and digestive disturbance. The treatment must be directed accordingly. Occasionally, purely symptomatic therapy must be added and then trional seems to answer the purpose remarkably well. It may be necessary to give codeine or small doses of morphine. The hectic fever of phthisis may often keep the patient awake, and then antipyrin or other antipyretic will hasten the sleep that comes with the morning defervescence. In old cases of emphysema, when there is considerable venous stasis, the treatment should be that of the in-

somnia of heart-disease: semi-recumbent position, heart-tonics, and stimulants. In the chronic pulmonary affections of old people, opium, cautiously used, is the best remedy.

It needs simply to be mentioned that malaria may cause wakefulness without chills or fever, or after these more violent manifestations have been subdued. This seems to apply particularly to children. Such insomnia is very apt to pertain to the early morning hours, like that of the other intoxications. The treatment, of course, embraces quinine and arsenic.

Diseases of the nervous system, organic and functional, cause, in the majority of cases, some disorder of sleep, but these symptoms scarcely merit extended consideration in this connection.

It is worthy of note, however, that the insomnia and other sleep-abnormalities of the aged are generally due to changes in the cerebral arteries and consequently in the nutrition of the brain. Sometimes there is increased somnolence instead of wakefulness. These disorders are frequent after cerebral hæmorrhage or thrombosis, and indeed are not rarely premonitory of such a lesion. The best treatment is the administration of light food (koumyss and matzoon are excellent) with a mild alcoholic stimulant, preferably hot, at bed-time. Digitalis and strychnine given through the day may be added.

Insomnia is not infrequently one of the early symptoms of organic brain-disease, as tumor, abscess, meningitis. To the same category probably belongs the insomnia of syphilis that is unaccompanied by pain or any other evidence of brain disease. Such cases occur, but it is reasonable to suppose that the brain is affected, either by a toxic agent or through alterations in the vessels. That gross brain-syphilis may cause insomnia as well as somnolence is well known, and the cure by active treatment is always prompt.

In paralysis agitans patients often complain bitterly of inability to fall asleep on account of muscular unrest, which I think is a part of the ever-present muscular rigidity of this disease. They cannot assume a comfortable position and are absolutely unable to procure that relaxation and bodily repose necessary to slumber. Duboisine is probably the best remedy for this, but like hyoscine, which is also useful, loses its efficacy after a time. Rather prolonged hot baths at bed-time, the hot pack, massage, trional, paraldehyde, and sulphonal are worthy of trial. Strong faradism, sufficiently vigorous to cause tetanization of the muscles, is at times a great relief, and the short relaxation, or feeling of relaxation, following the treatment may enable the patient to fall asleep.

The subjects of exophthalmic goitre are often kept awake by tachycardia, the violence of the cardiac impulse, and throbbing arteries. For this difficulty 20 to 30 drops of laudanum in some

demulcent, by the rectum, is the surest remedy, but, unfortunately, it cannot be employed often for fear of engendering an appetite for the drug.

DISORDERS OF SLEEP IN INFANCY AND CHILDHOOD.

THE healthy new-born babe sleeps constantly, except when taking nourishment. At six months, the child should sleep fifteen hours; at one year, twelve hours; from one to four, ten hours; and up to the eleventh or twelfth year, at least nine hours. At the time of puberty both sexes should have an abundance of sleep, as it is a critical period, the time to avert functional nervous trouble, especially migraine, and to fix a good sleep-habit. It is a solemn duty of the physician to caution parents against giving children too little sleep. Many persons, regarding the number of hours of sleep as a mere matter of habit and of no particular importance, allow children to retire late, and then, for convenience or on principle, get them up early in the morning. The habit of going to sleep readily, sleeping sufficiently, and waking promptly should be, and can be, early inculcated. Children need a good deal of wholesome letting alone.

Persistent insomnia in infancy and childhood is rare, and should at once awaken suspicion of acute infectious disease or some cerebral affection. Restless and broken sleep is common as a result of vicious education or of disease. There are, however, some perfectly healthy children who exhibit great bodily unrest in sleep. Rickets is a frequent cause of insomnia in children, as is also congenital syphilis—even when other signs of the disease are slight or wanting. Any disturbance of the gastro-intestinal tract, from thrush to ascarides of the rectum, may cause disordered sleep, and it should not be forgotten that infants are not rarely kept awake simply by hunger and thirst. Not only must the quantity of milk (or its substitute) be adequate, but the quality must be sufficiently good.

For the wakefulness of the acute fevers nothing compares with the free use of cold water externally and internally, although in the early stages trional and in the late stages alcohol are of distinct advantage.

Night-terror—*pavor nocturnus*—is almost confined to childhood and constitutes a reasonably distinct neurosis. Some attacks are doubtless simply examples of nightmare caused by errors in diet, and others approximate mild somnambulism with visions of people and objects. Still others are to be classed as juvenile hysteria. Adenoid vegetations are responsible for a considerable number of nocturnal nervous attacks in children. But beside all these there

remains a tolerably definite paroxysm still to be accounted for. This comes on ordinarily an hour or two after the child has fallen asleep—suddenly, in the midst of quiet slumber—and occurs but once in the same night. The little patient has the eyes wide open, screams with terror, evidently has visual hallucinations of a frightful character, and does not recognize persons, although he will often cling to them in his fright. The attack is generally of very short duration, but the child may be nervous and timid for some time afterward. The more the disturbance varies from this type, the more likely is it due to some reflex or ascertainable cause, although no sharp line can be drawn either through the character of the attacks or their etiology. Still a distinction should be made, for night-terror due to an overloaded stomach, a fright, or adenoids in the naso-pharynx is a much less serious affair than the same affection dependent upon a defective brain—the neuropathic constitution. This latter class seems to approach dangerously near to epilepsy.

The appropriate treatment is almost indicated by what has just been said. Every possible source of reflex excitation is to be sought out and removed. Rickets especially is to be carefully excluded, or, if found, properly treated. The evening meal is to be light, and all unnatural excitement, startling tales, and disciplinary threats rigorously avoided. These details having been attended to, should the attacks continue, and particularly should the patient have slight dizzy attacks or brief "absences" during the day, vigorous measures are to be adopted. The case is then to be treated as one of incipient epilepsy and the convulsive habit forestalled at once, if possible. Expense, convenience, and (in older children) school education are not to be considered. An absolutely perfect mental and physical hygiene is to be insisted upon, and, in addition, adequate doses of sedatives are to be administered. Bromide, alone or in combination with conium, belladonna, or cannabis indica, is probably the best, although sometimes full doses of trional and sulphonal for a short period will break up the habit. In a very refractory case I should not hesitate to use the Flechsig treatment of epilepsy.

I might add that occasionally a strong mental suggestion by means of a sharp physical impression (the parental hand to the buttocks, a cold douche—or the threat of it) has served to cure the disorder; but such means are generally futile.

The best remedies for nocturnal enuresis are almost complete abstinence from liquids after four or five o'clock, elevation of the foot of the bed, the cold spinal douche at bed-time, belladonna, and rhus aromatica. It may be necessary to systematically waken the child an hour or two after the beginning of sleep, so that he may evacuate the bladder. It should not be forgotten that the trouble

may be due to some removable condition, as to acid urine, vesical calculus, an abnormal prepuce, rectal irritation, etc., or to an abnormally small bladder. In a great many cases nocturnal incontinence is a stigma of neurotic degeneracy.

The insomnia of chorea is controlled by chloral or trional, and children can take relatively large doses of either drug. For that rare affection, nocturnal chorea, that is, chorea confined to sleeping or early waking hours, the same treatment is applicable. Full doses of arsenic should also be given.

NARCOLEPSY.

Recurrent attacks of irresistible sleep are not considered to constitute a disease *per se*, but to be always a symptom of some disease or abnormal condition. In the great majority of cases the attacks are due to either hysteria or epilepsy, but they may be caused by diabetes, chronic nephritis, disease of the heart, liver, or stomach, obesity, pregnancy, anæmia, or organic disease of the brain. Although the affection is but a symptom, it may be practically the only symptom of the causative disease and thus assume the appearance of an essential malady—as Gélineau and others have thought it to be. The frequency and duration of the sleeping-spells vary exceedingly. They may occur at long intervals or many times in a day, and last from a few seconds to several hours. The intensity or profundity of the sleep is also variable. Some patients awaken, if disturbed, as from a natural sleep; others cannot be awakened at all.

Treatment is reasonably successful if directed to the cure of the disease that causes the narcolepsy. Symptomatic treatment, on the other hand, by the administration of caffeine, theine, or alcohol, and by forcing the patient into violent exercise at the onset, has always been most disappointing.

THERAPEUTICS OF RENAL DISEASES.

By NATHAN S. DAVIS, Jr., A. M., M. D.

During the last five years no new methods of treatment have been devised for the relief of renal affections, and no new drugs of importance have been added to the list of those previously used. Something has been contributed to our knowledge of the mode of action of drugs in these maladies. The questions which have elicited most prolonged debate during this time have been the utility of a *milk diet* and the *diuretic powers of calomel.* Eminent clinicians have shown that a mixed diet will in some cases give as good results as the exclusive use of milk. All agree that when milk alone is tolerated by patients it has great advantages over mixed diet or over milk and farinaceous foods. The discussion has, however, led the profession to fear albuminous foods less and to rely more upon a clean alimentary tract and upon the prevention of intestinal fermentation. What of knowledge has been contributed to renal therapeutics can be best set forth in a general consideration of the action of drugs upon this class of diseases.

By medical and hygienic treatment we attempt to correct disturbances of function. It is, therefore, natural in introducing the subject of renal therapeutics to inquire, first, What are the functions of the kidney? and, second, How are they disturbed by the processes which we call disease?

It is the purpose of the kidney to remove any excess of water that may be in the blood and to excrete with it certain of the waste products of tissue-change. The first of these is accomplished chiefly by filtration through the capillaries within the epithelium which lines the glomeruli; the second is accomplished by the epithelium of the convoluted tubules, because of the peculiar selective and excretory powers of its cells. It is probable that some of the salts of the blood, such for instance as sodium chloride, escape with the water through the glomeruli, but the nitrogenous excreta undoubtedly escape through the cells of the convoluted tubules. It is also probable that some of the fluid which escapes through the glomeruli is absorbed again, as it passes from the convoluted tubules into the loop of Henle and the straight tubes. Possibly other substances are also thus re-absorbed; but whatever reabsorption occurs in man is trifling.

These functions of eliminating water and organic and inorganic salts in solution in it may be disturbed so that each is increased, diminished, or suppressed, or new, abnormal substances may make their appearance in it. Some of these changes may be due to modification of function which is not associated with change of structure, but more frequently change of structure develops coincidently with change of function or precedes the latter.

Changes in the quantity of urine or of its normal constituents often occur without structural lesions in the kidneys, but such abnormal ingredients as albumin, blood, and tube-casts only appear when well-marked anatomical changes have developed.

The quantity of urine may be increased because all the functions of the kidney are augmented, or because water only is escaping from the blood more rapidly than is usual. In diabetes mellitus the entire kidney is functionally unusually active, for both an abnormally large quantity of urine is eliminated, and an unusual quantity of the salts ordinarily excreted by these organs. The percentage of sugar present increases the specific gravity of the urine only triflingly as compared with its total increase in this disease. Its greater weight is chiefly due to an excessive elimination of urea and other salts. The presence of an excess of sugar in the urine provokes the unusual diuresis, but the rapid bodily waste and therefore the excessive tissue-change throughout the body gives the kidneys an unusual amount of eliminative work.

In diabetes insipidus or essential polyuria it is the glomeruli which are put to excessive use, and there continuously filters from them more fluid than is normal, but as no unusual supply of eliminable material is brought to the cells of the convoluted tubules the urine is relatively light in weight, or, in other words, its percentage of salts is low.

POLYURIA.

Polyuria is due to a variety of causes, some of which are temporary in action and therefore produce no effects requiring treatment. This is true of the excessive urination which is provoked by copious drinking. Large quantities of pure water may produce such polyuria, but oftener it is large quantities of milk, beer, or beverages strongly charged with carbonic acid gas, which are more powerfully diuretic, that provoke the unusual flow of urine. An excess of sugar, or urea, or both, in the blood will cause polyuria. This can be corrected only by preventing the excessive production of these substances in the body. A modification of diet, such for instance as abstinence

from sugar and starches in the one case, and from albuminoids in the other, may effect the object. But oftener the presence of these substances in the blood in unusually large amounts is due to faults in the functional activity of the pancreas, liver, or tissues generally. Such polyuria does not demand medication addressed to the kidneys. Excessive urination may result from diseases of the nervous system. A centre has been demonstrated in the medulla which at least in part controls the activity of the kidneys. Structural diseases of the brain, medulla, and upper cord have been associated with excessive urination, and with its suppression. A frequently recurring symptom in the functional nervous diseases epilepsy and hysteria is polyuria. Many times it follows an epileptic paroxysm, and quite as often occurs with or during the subsidence of hysterical excitement. In these diseases, also, no medication is required for so transitory a condition.

The polyuria which accompanies renal diseases, notably amyloid kidney and interstitial nephritis, is protective and is to be encouraged, not checked. In these maladies a diminished excretion of nitrogenous waste, which may endanger life, is apt to occur because of the destruction of renal epithelium which characterizes them. If the quantity of urine can be kept large, though its specific gravity may be low, danger to life is lessened. The only form of polyuria which demands treatment is the essential form often called diabetes insipidus.

Diabetes insipidus is characterized by the elimination of an excess of urine, as much as 25 to 50 pints per diem in some instances. The urine is pale, limpid, of low specific gravity, 1001 to 1005. The total of the solids in it is small, although sometimes the quantity of urea is relatively large. Abnormal ingredients are rarely found in the urine in this disease. An excessive thirst accompanies the polyuria. The tongue is usually dry. Appetite may vary, but is generally good. Loss of flesh is not uniformly present, for patients afflicted with the malady may maintain good body-weight. An appearance of good health exists, but usually malaise and lessened endurance are noticeable. The skin is apt to be dry, possibly because of excessive elimination of fluid by the kidneys. This malady may last for years. Death usually results from some superimposed disease. Spontaneous cures have been observed.

No anatomical changes are characteristic of essential polyuria. Even its exact nature is unknown. Its peculiar symptom is probably due to changed blood-pressure within the renal vessels produced through the agency of the vasomotor nerves.

The conditions under which it is likely to arise can rarely be modified favorably.

It occurs at all ages, but oftenest in those who are young, and in males. It has been known to be congenital. It not infrequently recurs in the same family in different generations.

Although by no means constantly associated with structural changes in the central nervous system, or with sudden mental shock, it frequently is. Traumata have apparently provoked this syndrome, as have tumors of the brain and lesions of the medulla. Paralysis of the sixth pair of nerves has so often been associated with diabetes insipidus as to attract the attention of clinicians. Sunstroke, violent excitement, great emotion, have been regarded as conditions essential to its production in some instances. It has followed the drinking of excessively large quantities of cold water, and of cold beer and other alcoholics.

When this malady is treated, the quantity of fluid ingested must first be regulated. It must be lessened gradually to a normal amount, about three pints. Especially should very cold beverages be avoided, and milk, beer, cider, and other alcoholics, as they are diuretics. Watermelon and grapes should be eaten sparingly, if at all. The free use of sugar and very amylaceous food is not permissible. Emotional excitement and both mental and physical fatigue must be avoided. Exercise, however, that is regular and moderate in amount is commendable. An abundance of rest and sleep is desirable. Assistance can be obtained by provoking the vicarious elimination of fluids from the lungs, skin, and intestines. Respiratory exercise, especially in a dry climate, will accomplish this. A residence in a dry and attenuated air will readily quadruple the elimination of fluid by the lungs and skin. Altitudes of from 4000 to 6000 feet in Colorado, New Mexico, and Arizona are especially adapted to these cases. At lower altitudes, and in moist climates, breathing exercise, hot-air and hot-water baths, dry friction of the skin, and warm clothing will aid in effecting an amelioration. Rarely pilocarpine or jaborandi have been resorted to. The provocation of free catharsis by drastics, salines, or calomel will also do good.

As is true of most diseases that are particularly persistent, a great many remedies have been recommended for this one, none of which are uniformly useful. Because of the persistency of the malady and its uncontrollability by medicines, physicians feel the need of many things to which to resort. In each case which I have had to treat I have found my former experience of little value. The class of drugs most uniformly beneficial is that which acts upon the nervous system. Valerian in large doses is one of the best. Castor, musk, asafœtida, camphor, and belladonna have also been used. They are most useful in cases following strong emotion and great excitement. Opium, as is well known, lowers arterial tension, and to a marked extent diminishes

the formation of urine; this drug and its derivatives morphine and codeine are among the best remedies for this malady. The bromides have also been employed, but are much less uniformly efficacious. Nux vomica has apparently done good. The benefit obtained from it, from belladonna, ergot, and astringents is due to the contraction of renal arteries or afferent branches to the glomeruli, and consequently a diminished supply of blood to the glomeruli. But unfortunately these drugs have no selective affinity for the kidneys. They commonly contract all blood-vessels simultaneously and increase arterial tension generally. Whenever this is effected increased diuresis rather than lessened is the result. The perchloride of iron, the acetate of lead, and tannic and gallic acids have been administered internally, hoping that their astringent properties would lessen the flow of urine. Antipyrin, phenacetin, acetanilide, and salicylates have been used because of their analgesic properties.[1] It is, however, more probable that their diaphoretic properties are their valuable ones in this malady. Balsamic preparations have also been lauded, such as copaiba, turpentine, and balsam of tolu. They are, on theoretic grounds, contra-indicated, for they produce active congestion of the renal vessels which provokes diuresis. A diminution of urine can only be effected by them when they are used in dangerously large doses, which produce inflammation of the kidneys or a degree of congestion which closely borders upon it.

The continuous electric current has sometimes been employed with apparent benefit. It has been passed from the lumbar to the cervical region along the spine. In those cases complicated by anæmia and debility, iron, quinine, and reconstructives are needed. The iodides and arsenic are frequently employed, although no good reason can be given for their use.

DIMINISHED URINATION.

As the water of urine and the salts which it contains are, for the most part, excreted through different structures, the ratio between them, day by day, may vary greatly. The excretion of fluid depends upon difference of pressure in the vessels of the glomeruli and in the renal tubules, while the excretion of urea and other so-called solids depends upon the vital activity of the cells lining the convoluted tubules. Although these structures may act independently, and commonly do when the kidney is healthy, the function of both is, in disease, usually lessened simultaneously. A moderately copious flow of

[1] A. Duchamp, *Traité de Thérapeutique appliquée*, fasc. ii. p. 133.

urine is essential for the removal of all the solids that need elimination. Therefore a partial suppression of solid excreta occurs whenever the quantity of water eliminated is much diminished. If the kidneys fail to perform their functions death occurs. It is not produced suddenly. Several hours are necessary for its accomplishment. It is due to intoxication by substances which accumulate in the blood and nervous tissues when they are not eliminated by the kidneys. This intoxication is gradually developed, for time is necessary to accumulate the poisonous excreta to a fatal dose.

Complete and Partial Anuria.—All degrees of *lessened renal activity* may be observed, from complete suppression to a very slight diminution of the quantity of urine. To have the glomeruli inactive is of little import, and is always a transitory phenomenon, unless the function of the other renal structures is simultaneously modified. It is, however, important to know how the function of the glomeruli can be increased, for it often must be, in order to carry an excess of fluid away from some part of the human body.

The quantity of urine is lessened when the blood-pressure in the renal vessels is low and when the renal tubules are obstructed. These changes may be effected by a variety of morbid conditions, which it is the duty of the therapeutist to remove or modify. The blood-pressure is low whenever the heart is feeble; whenever dilatation takes place in large vascular areas, as, for instance, in the intestines; and whenever contraction of the renal artery or vessels afferent to glomeruli occurs. These latter changes almost never occur, for the morbid states which cause contraction of renal vessels cause contraction extensively in other than the renal vessels, and therefore raise blood-pressure and provoke diuresis.

It is conceivable that the splanchnics may be excited by neighboring inflammation or by pressure of tumors or contracting tissues, and thus provoke contraction of renal vessels. Such lesions are so much more apt to destroy these nerves that the opposite result, dilatation of renal vessels, is the rule. Dilatation in large vascular areas, as in the skin or intestines, occurs sometimes in the former from exposure to heat, in both from sudden congestion due to the application of irritants which may ultimately produce inflammation. It may be caused by some medicines, as by those which provoke intestinal congestion, or by paralysis due to injury of the medulla, spine, or splanchnics.

Whenever inflammation occurs in a kidney the function of the organ is modified by both vascular and tubular changes. The current in the inflamed capillary tuft is slow. The glomerulus is filled with serum in which a few corpuscles float. The difference of pressure within the capillaries and outside them is slight, therefore diuresis is

lessened. At the same time many of the renal tubules are obstructed by casts, loosened epithelium, and granular matter, the result of disintegration of cells. Other tubules are lessened in calibre by the swelling of epithelial cells lining them, and by congestion and œdema of the surrounding interstitial tissues. All of these changes tend to lessen diuresis. When the epithelium has been extensively loosened and lost, and the tubules enlarged in calibre, the flow of urine is augmented unless vascular changes prevent it.

Another factor entering into the complex process of inflammation that tends to lessen the flow of urine is inflammatory œdema. It causes fluid to find its way into the tubules in considerable quantity through the interstices of the epithelium, and helps to fill the tubules, increases the pressure of fluid in them, and therefore lessens filtration through the glomeruli. When cirrhosis develops in kidneys diuresis is increased, for only small areas are involved in inflammation at one time, and in the other comparatively healthy parts blood-pressure is raised, as it is in the arteries of the body generally. Therefore, although little by little the renal tissues may be extensively destroyed, the healthy portion excretes an unusual quantity of fluid so long as the heart retains its strength and maintains high arterial tension.

When there is general œdema, not infrequently the kidneys become dropsical. The flow of urine from them is then greatly lessened, both because of pressure of the distended interstitial tissue upon the tubules and because of the partial filling of the tubules from the lymph-spaces, as just explained in inflammatory œdema.

Passive congestion of the kidneys, due to cardiac or pulmonary diseases, or to pressure upon the renal veins by tumors or cicatricial tissue, is a common cause of diminished diuresis. When this lesion is fully developed, the secretion of urine is lessened, as it is in nephritis. Congestion of the tissue about the tubules tends to narrow them; the cells lining them swell and lessen their calibre still more; often casts and loosened cells fill and obstruct them. Transudation of serum from the surrounding capillaries into the tubules fills them and lessens the difference of pressure within them and the glomerular vessels, which also checks diuresis. Œdema is commonly associated with passive hyperæmia of the kidneys.

Another occasional cause of diminished flow of urine is the presence of an obstruction in the ureters. This may be a stone, compression by cicatricial tissue outside of them, or pressure of tumors or misplaced organs upon them. When the kidneys themselves are movable a kink or sharp bend may partly or completely obstruct the ureters.

Sudden and complete suppression of urine may be due to embolism of both renal arteries; an accident of most infrequent occurrence.

Suppression of the function of the kidneys produces an accumulation of waste products in the blood which are abnormal in considerable amount, and some of which are extremely poisonous to the central nervous system. These substances are primarily produced in the cells of the various tissues of the body, or are absorbed in the alimentary tract from foods that are eaten, or are products of fermentation in the contents of the intestines. Salts of potassium are absorbed in large amounts, and become poisonous when they accumulate in the blood. Various nitrogenous substances, which are always present in the blood in moderate quantity, are toxic when accumulated there in considerable amounts. They are derived in part from nitrogenous food and in part from waste of tissues. Some of these latter substances require modification by the liver that they may be made eliminable in the urine or in the bile. The liver should prevent most of the products of intestinal fermentation from entering the general circulation. Unfortunately, in many of the diseases in which the kidneys are inactive the liver is so also, and therefore the opportunity for the accumulation of toxic matter in the blood is increased.

URÆMIA.

The most striking symptoms of renal insufficiency grow out of the effect of retained poisons upon the nervous system. A diminished excretion of urine, or of urinary solids, generally escapes attention until striking nervous manifestations develop. If the onset of renal insufficiency is sudden or rapid, the symptoms of acute poisoning, *acute uræmia*, are displayed. If, as happens quite as often, the insufficiency is of slow and gradual development, the nervous system becomes in part habituated to or tolerant of the poisons, and the symptoms are those of *chronic uræmia*.

Convulsions or coma, or both together, characterize acute uræmia. These symptoms may develop suddenly without premonition, or they may be preceded by some of the phenomena of chronic uræmia. Convulsions rarely occur without coma, although the latter is sometimes not deep. Coma without convulsions is of much more frequent occurrence. In most cases stupor or unconsciousness exists in the intervals of quiet between successive convulsions. The latter also vary much in severity. They may be limited to slight twitching or may be violent generalized movements. Death occurs especially when the convulsions are violent because they interfere with respiration. Coma may be deep from the start, but oftener begins with drowsiness and deepens into stupor and unconsciousness. The pulse and temper-

ature are commonly unchanged. When convulsions are violent the temperature sometimes rises temporarily. The pupils may be large, small, or normal.

Symptoms of chronic uræmia are manifold. They often consist in periodical headaches; in anorexia, or nausea and vomiting, or diarrhœa; in respiratory disturbances, such as asthma and Cheyne-Stokes respiration; in sudden temporary blindness or deafness; in formications and numbness; rarely in delirium either maniacal or muttering. At times in the breath of patients and in exhalations from their bodies a urinous odor is detectable. In uræmia the quantity of nitrogenous matter voided by the kidneys in twenty-four hours is always lessened, although its percentage in samples may be high at certain times in the day. Usually the total quantity of urine voided is diminished, but in chronic interstitial nephritis it may exceed a normal average, although the excretion of waste is diminished. In treating uræmia it must be constantly remembered that the condition of the kidneys alone rarely produces the intoxication, but simultaneous derangement of the liver and unwholesome fermentation of the contents of the alimentary tract helps to cause it.

In order to avert suppression of urine either partial or complete its causes must be borne in mind. The conditions which lead to the anatomical changes provocative of renal insufficiency must be removed. As renal congestion and inflammation are especially apt to occur in infectious diseases they must in such cases be averted. Preventive measures consist in protecting the skin against sudden chilling by woollen garments and warm clothing. Attention must be directed to this especially during convalescence from infectious diseases. In the period of fever exposure is rarely harmful, but during convalescence, when the body is weak and reaction to cold takes place slowly, congestion and acute inflammation of the kidneys are common. In order that the chemical changes of nutrition may be as perfect as possible, and waste products as thoroughly eliminated by the lungs as they can be, it is best that the patient's room be kept cool and the air in it fresh. During convalescence from those diseases which are oftenest complicated by nephritis and uræmia, patients should be kept unusually long in bed and in one room. It is quite as essential that the skin be kept clean as that the lungs should be filled with fresh air. Frequent bathing is therefore necessary. The mouth and other cavities of the body should also be cleansed in order that toxic matter may not be absorbed from them. The bowels must be emptied regularly and freely. Foods which easily ferment must be avoided, as well as those which are rich in potassium salts and extractives. Alcoholics should be forbidden because they are irritating to the urinary channels and because they interfere with normal tissue-

change. Water should be taken copiously. If uræmia threatens or exists in a mild form, abstinence from food for a few hours, or even one or two days, the use of water freely, and a prompt, copious purge will often cause all traces of the malady to disappear.

Whenever albumin is present in the urine and uræmia is evident or justly to be feared, food, if it must be taken, should consist exclusively of milk. It is best because it leaves in the intestines a residue that is only slightly toxic and little liable to become so. It is also a diuretic of the first order, promoting greater activity both of renal epithelium and glomeruli. So long as uræmic symptoms exist other albuminous foods should not be taken. If uræmia has subsided, meat, fish, and eggs ought not to be eaten for some days—not until a copious excretion of urine of fairly normal character has been well established. A milk diet is not well tolerated by many patients, and cannot be rigidly adhered to. It can be varied by the use of farinaceous foods and fruit. But even when such articles are permitted, milk should form the chief ingredient of the diet.

I have so frequently seen complete abstinence from food, with copious bowel movements, relieve mild uræmia that I can strongly recommend such practice if patients are sufficiently vigorous to bear starvation for a time. Within a few weeks I have seen two patients undoubtedly relieved of uræmia in this manner. One, a woman, was in the midst of maniacal uræmia. The mental cloud disappeared in forty-eight hours upon a water diet and pills of elaterium. The second was in great distress because of Cheyne–Stokes respiration, anorexia, and vomiting. Other modes of treatment—mild cathartics, diuretics, and diaphoretics—were tried with little avail. When even a milk diet was stopped, and freer catharsis provoked by salines, improvement soon began. All gastric and respiratory discomfort were for the time relieved.

In those diseases liable to complication by renal insufficiency, chemical antipyretics should be avoided, for even more than alcohol do they interfere with proper tissue-change. They destroy the oxygen-carrying power of blood in proportion to their efficiency as prompt febrifuges. Cold baths are not, however, contraindicated in the same way. Febrile diseases treated by them are found to be infrequently complicated by renal disorders. They provoke healthier tissue-change, stimulate circulation, promote diuresis, and under their influence the urine becomes more nearly normal.

When uræmia exists, complete rest should be enjoined, but when it is feared rather than present, gentle exercise is to be commended, for it promotes more perfect metabolism and helps to eliminate from the tissues the products of their own waste which are often toxic to them. Massage and passive movements must sometimes be prescribed

for those who are too feeble to take active exercise. But exercise should never be exhausting or very fatiguing.

If renal congestion causes either acute or chronic uræmia it should be lessened by (*a*) bleeding whenever the patient is strong. More of poisonous matter can be rapidly removed from the blood by this than by any other means. If blood is abstracted by leeches placed on the loin between the lowermost ribs and the crest of the ilium, and between the outer edge of the oblique muscles of the abdomen and latissimus dorsi, congestion of the kidney can be directly influenced, as in this area the superficial vessels anastomose with the renal. If, however, uræmia is mild one may safely trust to (*b*) depletion by the intestines, and to (*c*) cardiac tonics which can relieve renal congestion by promoting a more vigorous circulation and higher general blood-pressure.

When nephritis exists an attempt must be made to keep the renal tubules permeable.

The stomach and intestines must be kept clean and fermentation in them must be lessened. The dietetic regimen already described will help to accomplish this. Gastric and intestinal antiseptics must be used with caution, for most of them are eliminated by the kidneys, and are more or less irritating to them. This is especially true of carbolic acid, resorcin, and naphthol. The preparations of bismuth are the least harmful, especially the subgallate and subnitrate. Bouchard has strongly recommended large doses of charcoal to absorb or modify and to prevent absorption of many of the toxic compounds produced within the alimentary tract by fermentation. Cathartics are essential to cleanse these organs. Salines usually are sufficient. They should be given in concentrated form when the stomach is empty, and no fluid should be taken until after they have moved the bowels, if it is desired to deplete the kidneys and to promote vicarious elimination of waste matter from the blood. Calomel is also a useful purge. It is at the same time an intestinal antiseptic and diuretic of value. It cannot be used day after day, for it will produce salivation and may even irritate the inflamed kidneys. It is rather to be resorted to from time to time. If one aims to promote vicarious elimination as well as to cleanse the bowel, the best results are obtainable from elaterium and similar drastics. They soon produce intestinal distress and must be discontinued. They can be employed most advantageously during the first day or two of severe uræmia. If it is relieved the bowel can be kept clean and more moderate depletion maintained by salines.

Vicarious elimination by the skin is quite as essential as by the intestines. To promote as vigorous action of it as possible, heat should be applied to it. Patients having chronic uræmia who are still fairly strong generally prefer a hot bath. They should be completely

immersed in water as hot as can be borne and should be kept in the tub fifteen or twenty minutes. When they leave the water they should be rapidly dried, briskly rubbed, and put at once to bed under woollen blankets and warm comforters, in order to maintain diaphoresis for some time longer. Such baths may be repeated daily, or at longer intervals, as seems needful. If a patient is comatose or too feeble to be taken from bed a hot-air bath in bed is best. If, before heat is applied, the skin is briskly rubbed for a few minutes sweating is provoked more quickly. The patient should be covered with the warmest bedding and under it hot air from an oil lamp beside the bed should be conducted by a section of bent stove-pipe. Copious sweating can be thus provoked with ease, and can be maintained for a half-hour or more as seems best.

Pilocarpine, when administered hypodermically or internally, will also produce free diaphoresis, but it so often produces distressing salivation and cardiac weakness that it is rarely used except in extremely urgent cases and when the heart is strong. Recently its employment endermically has been commended. Five centigrammes mixed with one hundred grammes of lanolin or vaseline, rubbed thoroughly over the body and legs will cause copious sweating, especially if the patient is immediately wrapped in wool. The pilocarpine acts directly upon the glands of the skin. None seems to be absorbed, and consequently no bad effects are produced by it when used endermically. This method of administering pilocarpine I have tried and have found it successful.

The skin should be kept in an active state and clean even if actual sweating is not deemed necessary. Gentle rubbing and warm or plunge or sponge baths will accomplish this. They can be used daily or nearly so with advantage.

One other drug is employed with the hope that it will modify any abnormal metabolism that may exist. I refer to oxygen. I have never been able to convince myself that its inhalation did good unless respiration was impeded. Theoretically, if the bronchial tubes and lungs are unobstructed, we can expect the blood to take up no more oxygen when it is inhaled pure than when it is diluted as it is in air. If, however, breathing is difficult and the blood must be oxygenated in a small portion of the lungs only, pure oxygen will contribute greatly to the comfort and well-being of the sufferer. It is of utility when Cheyne-Stokes respiration is distressing, and of still more assistance if there is uræmic asthma or pulmonary œdema.

Uræmic disturbances of respiration often form indications for special treatment. Cheyne-Stokes respiration, which is observable frequently in uræmia, is best relieved by the general treatment already outlined. Its intensity can often be lessened, and therefore

the weariness and distress which it causes be mitigated, by full doses of bromide of sodium, chloral, or opium. The first two are to be preferred. The latter is to be avoided if possible, because it lessens diuresis, dries the skin, and diminishes the functional activity of most glands. These drugs produce their good effects by benumbing the central nervous system and making it less susceptible to the poison of uræmia. They are also useful when asthma is a uræmic phenomenon. The nitrites can be employed both in asthma and Cheyne-Stokes respiration. They undoubtedly act chiefly upon the motor nerves, and especially upon their termini in muscles. By lessening the irritability of these structures the muscles are less liable to be thrown into spasm or their rhythmical action to be modified. Dilatation of the vessels of the medulla plays a part in effecting the relief which these drugs afford to Cheyne-Stokes respiration. Nitrite of sodium and nitro-glycerin are to be preferred, for their effects are more persistent than those of nitrite of amyl: 1 to 3 grains of the first can be used, and from $\frac{1}{2}\frac{1}{0}\frac{}{0}$ to $\frac{1}{5}\frac{}{0}$ of the second. These doses can be repeated hourly for a few times if necessary, but generally need not be employed more than three or four times daily.

Anorexia and vomiting are not infrequent uræmic symptoms. Both are best relieved by the treatment already outlined for uræmia. Whenever the patient's strength will permit, abstinence from food, the ingestion of an abundance of water, and free catharsis give quicker relief than can be obtained by any other mode of treatment. Cleanliness of the alimentary canal is of importance in all uræmias, but of the greatest in those cases in which gastric symptoms predominate. As abstinence from food can only be maintained for a few hours, diet is all-important. Milk, or, if it be vomited in large curds, a modified milk made of cream and milk-sugar with a small proportion of skim-milk and enough lime-water to make it slightly alkaline, may be used advantageously. It is best given in small quantities, one or two tablespoonfuls, every hour at first. So soon as it is demonstrated that the stomach will tolerate it the quantity should be increased. If possible, a strict milk diet should be adhered to. If this is impossible, gruels may be substituted. The diet must be the same as for uræmia, but food must be more carefully administered. Such anti-emetics as carbolic acid, resorcin, and sulphocarbolate of zinc are contraindicated because they are irritating to the kidneys and may increase the renal inflammation. Indeed, if used, they seem to produce little effect. Cerium oxalate and preparations of bismuth can be employed without danger, but in vomiting of uræmic origin they do little good. Opiates will often lessen the irritability of the stomach. I have seen this illustrated very recently in two cases. An attempt was at first made to relieve persistent vomiting by the com-

mon treatment of uræmia. Anti-emetics were employed unavailingly, but 10-drop doses of paregoric, repeated hourly three or four times, gave relief in one case; a single dose of morphine, $\frac{1}{8}$ of a grain, gave relief in the other. Unfortunately, opiates lessen the excretion of urine and increase the danger of profound uræmia. They must therefore be used with caution and only temporarily.

Not infrequently persistent diarrhœa is a uræmic symptom. If it is not too severe and exhausting, it is rather a benefit than a detriment to the patient. It is probably a spontaneous attempt at vicarious elimination of uræmic poisons. It, however, often becomes exhausting and must be controlled. If opiates are employed at all in such cases they must be used with caution. Whenever it is possible the enteritis should be controlled by astringents only.

Maniacal uræmia rarely requires special treatment. Deep congestion of the meninges has been found in most fatal cases of this kind. It is probable that the brain-symptoms are in part the result of it. Bleeding does good by withdrawing both poison from the system and blood from the brain. The meningeal congestion is perhaps most certainly relieved by leeches applied behind the ears. Veratrum and aconite also help it by relaxing the peripheral arterioles.

NEPHROLITHIASIS.

Although the kidneys are competent, not infrequently certain ingredients of the urine are eliminated in abnormally large quantities, leading to their deposition in solid crystalline forms either in the substance or the pelvis of these organs. Stone in the kidney or *nephrolithiasis* is also due sometimes to decomposition of urine in the kidney-pelvis. Two large groups of cases of stone are recognizable: one in which the stone forms in acid urine; the other in which it forms in alkaline. The former includes the uric acid and oxalic acid calculi; the latter the phosphatic. Calculi are not infrequently of mixed structure. A tendency to form both uric acid and oxalic acid calculi may exist simultaneously. A calculus made of either of these substances may excite pyelitis, which in turn will produce alkaline urine by provoking fermentation in it, and then phosphates may be deposited as a layer upon the original stone, or form new ones. Phosphatic calculi within the kidneys are always preceded by and associated with catarrh of the pelvis.

The symptoms of stone are in mild cases aching in the back or loins, usually upon one side only, especially when patients stand long or are much jolted. An excess of mucus and some pus can often be found

in the urine. Hæmaturia is not infrequent, especially when stones are composed of oxalic or uric acid. Stones may lie in the pelvis of a kidney or remain partly imbedded in its substance indefinitely without producing symptoms. When stones are passed from the kidneys renal colic is provoked. Very fine renal sand can be voided without pain, but it oftener produces discomfort and sometimes colic. The pain of renal colic is first felt in the loin, later diagonally across the lower part of the abdomen toward the bladder. At the same time lancinating pain will often strike the testicle on the affected side. An inclination to urinate with frequency is the rule. When stones are large colic is apt to be severe. Its location is that of the milder pain, but when intense it can be located with difficulty, for it seems to be diffuse. The symptoms of collapse may develop in cases of intense pain. Nausea and vomiting are common even in milder ones. A diagnosis of the kind of stone that produces a colic can only be made by examination of it.

Uric acid calculi are due to uricacidæmia—that is, a dyscrasic state or constitutional fault characterized by an excess of uric acid in the blood. Or, they may be due to great acidity of the urine, which is commonly caused by an excess of acid phosphates. An excess of the latter is due to a fault in nutrition, the exact nature of which is unknown. Individuals who are liable to uricacidæmia are also liable to excrete unusually acid urine. The two conditions which lead to uric acid lithiasis are therefore apt to exist together. The free use of nitrogenous food tends both to increase the formation of uric acid and to make the urine acid.

These facts give us a key to prophylactic treatment for those who have uric acid calculi. Albuminous foods should be permitted only in small amounts. The least objectionable are chicken, fish, oysters, and eggs. It is best to advise that meats be eaten very sparingly. On the other hand, a vegetable diet if adhered to too strictly may increase an existing tendency to the formation of oxalic calculi. Patients should be instructed to drink copiously pure water in order to increase the quantity of urine and to wash as much of saline matter as possible from the blood, thus preventing its lodgment in the urinary passages. Alcoholic drinks should be interdicted, for they lessen oxidation of waste products and are irritants to the urinary channels. Moderate exercise can be encouraged, for it promotes more complete and perfect metabolism, and whenever that exists waste products are most certain to be transformed into as eliminable a form as possible. Violent exercise will produce an excess of waste and overtax the organs of elimination. By friction of the skin and warm baths its excretory power can be encouraged. Derangement of the stomach and bowels is a common cause of uricacidæmia and

oxalicacidæmia. Such conditions should be corrected and their return prevented.

Medicinal treatment consists mainly in making the urine alkaline and keeping it mildly so, in making with uric acid soluble compounds, and lastly in provoking freer diuresis. Bicarbonate of sodium or potassium is often prescribed as an antacid in doses of from two to four grains daily. The carbonate, citrate, and benzoate of lithium are also favorite remedies. They not only make the urine alkaline, but are supposed to form lithium urate, which is a readily soluble salt. The daily dose of these is from 40 to 60 grains. The benzoates (of sodium, potassium, or lithium) have the added advantage that they form with uric acid soluble hippurates. While these reactions with uric acid are easily demonstrable in the laboratory it has been denied that they occur in the human organism. In the stomach lithia meets phosphates and triple phosphates, forming with them nearly insoluble compounds which prevent its reaching the uric acid of the blood and tissues. Moreover, Haig claims that by depriving the blood of part of the phosphate of soda which it normally contains, and which it gets from the alimentary tract, the excretion of uric acid is actually lessened instead of increased. The phosphates form soluble combinations with uric acid and aid its elimination. In spite of these contradictory views lithia is generally conceded by clinicians to do good. The best results, however, are usually obtained from very dilute solutions such as natural lithia waters. The diuresis produced by the imbibition of large quantities of fluid is probably the chief cause of good results when these waters are employed.

Piperazin is a drug which has been used for a comparatively short time. It is certainly efficacious. It increases the oxidation of excrementitious matter and makes uric acid soluble. It may therefore lessen its formation, and certainly aids its elimination. Although when stones of moderate size exist they cannot be dissolved by any agent as yet known to us, uric acid sand may be, and I believe the sharp corners of even larger stones can be smoothed. One of my patients who was long under treatment passed uric acid gravel often, and passed smooth stones whenever piperazin was used for some time, and angular, acicular stones when it was not employed. The daily dose of this drug is about 45 grains.

To lessen the concentration of urine it is all-important to increase diuresis. Alkalies will help to promote it, but reliance must chiefly be placed upon water and milk. Patients should be encouraged to use them freely. Diuretics, irritating and congesting the kidneys, should not be used.

When calculi are composed of oxalic acid it is essential that the usual atonic condition of the intestinal tract which provokes flatulence

and constipation be corrected. Foods which contain oxalates must be forbidden; the commonest of which are rhubarb, sorrel, tomatoes, tea, spinach, cabbage, and celery. Alkalies are useless as solvents. A variety of acids have been employed with the hope that they would dissolve the oxalates, but they have proved worthless. Diuretics do good, but they must be employed with caution, for at times they provoke the passage of calculi and precipitate renal colic or hæmaturia. They do good by washing the oxalates from the system before they can be deposited in the tissues.

When calculi are phosphatic, the amount of vegetable food eaten should be restricted so that the urine will not become unnecessarily alkaline. Such acids as nitric and citric, and such drugs as acid sodium phosphate, have been used to make the urine acid and to prevent its decomposition and the precipitation of phosphates. The results have not been satisfactory. In this form of lithiasis, as in the others, diuretics are of prime importance, and none are better than water and milk. As phosphatic stones in the kidney are always associated with catarrhal inflammation of its pelvis, this lesion must be combated.

Water or milk to be efficacious as a diuretic must be used in considerable quantities. Often patients are unaccustomed to drink much of either. For such it is best to prescribe water in gradually increasing amounts, at first three or four glasses daily, and an increase of one glass every one or two days until four to six pints are taken each twenty-four hours.

Mineral waters are used extensively in Europe to combat renal lithiasis. The waters in this country often employed with benefit are the almost pure waters, those unusually free from mineral matter, such as the Waukesha waters, and lithia waters such as the Londonderry, Buffalo, and Geneva lithia. It is probable that they do good because they are taken in quantities which make them diuretic. The Kissingen, Vichy, and Geyser springs of Saratoga (New York), and those of Vichy, Vals, Contrexeville, and Kissingen in Europe, are especially good for patients who are strong and dyspeptic. They are rather contraindicated for those who are anæmic, weak, or neurasthenic. The West Baden spring of Indiana, the Congress and Hathorn of Saratoga, and the Carlsbad of Austria, are useful for the same class of patients, and are especially good for those who are stout. The mineral matter in these waters stimulates better oxidation of waste and helps to correct digestive and intestinal disorders. The West Baden and Carlsbad waters are decidedly laxative as well as diuretic. Those first named only stimulate metabolism and provoke diuresis. When there is pyelitis, sulphur waters often prove beneficial, such as can be obtained from White Sulphur Springs (Virginia) and Richfield

Springs (New York). Hydrotherapy is contraindicated when there is a strong tendency to renal hæmorrhage; when the bladder is either very irritable or paralytic; when there is hydronephrosis, interstitial nephritis, or simple polyuria. Undoubtedly much of the benefit obtained by patients when they visit mineral springs is derived from change of climate, scene, mode of life, and freedom from care.

Frequently before prophylactic or curative treatment can be instituted renal colic in mild or severe form must be combated. I have seen mild attacks recurring every few weeks for two or three years stopped by a single catheterization of the affected kidney, and the removal of a drachm or thereabouts of uric acid sand. If the pain, which accompanies the passage of renal gravel, is slight or moderate, complete rest, counter-irritants over the kidneys, hot baths and diuretics may suffice. Morphine and belladonna administered by the mouth are usually needed to relieve renal colic. When vomiting occurs medicine cannot be given *per os*, but must be administered hypodermically or *per rectum*.

Whenever colic is severe the prime indication for treatment is to relieve pain, and a secondary one is to hasten the expulsion of the stone. So violent is the pain, and oftentimes so excited is the patient, that anæsthesia must be produced by chloroform or ether. If the pain is thus allayed temporarily, an enema of chloral or a hypodermic of morphine can be given to prolong the relief. It is usually impossible to give drugs by the mouth under these circumstances, for vomiting is frequent. Much care must be taken not to administer morphine and chloral in doses that are too large or to give them too frequently in large doses; for while the pain lasts safe quantities sometimes seem useless, but if they are given in unduly large amounts, when the pain suddenly ceases (as it often does) symptoms of poisoning develop. It is best to help out these drugs by inhalation of chloroform and ether. They not only relieve pain but relax the muscular spasm. Belladonna and stramonium are often used as adjuvants. They paralyze unstriped muscle-fibres such as partly form the wall of the ureters. They therefore help to relieve the colic which spasm of the ureters produces. Unfortunately, unless used in almost toxic doses they will not accomplish this. Atropine is, however, commonly combined with morphine when it is administered for renal colic. Unless a patient is anæsthetized or narcotized rest cannot be maintained provided the colic is severe. Copious draughts of water are desirable to help provoke a rapid expulsion of a stone, but often they cannot be taken because of vomiting.

HÆMOGLOBINURIA AND HÆMATURIA.

By *hæmoglobinuria* is meant the occurrence of hæmoglobin in urine in a state of solution. It gives to the latter a characteristic blood- or brownish-red color. By *hæmaturia* is meant the occurrence of red blood-corpuscles in sufficient numbers to give it a blood-color. We are now interested only in hæmaturia of renal origin. It may be due to injuries, to crushing, to a fall, or to blows upon the back or sides. It occurs in many renal disorders, in congestion of the kidneys, acute nephritis, suppurative and tubercular nephritis, renal cancer, embolism, calculi, and hydatids. Calculi and inflammation of the pelvis may also provoke hæmorrhage. It occasionally occurs in abnormal blood-states such as purpura hæmorrhagica, scurvy, and malignant fevers. It is endemic in certain localities within the tropics. Infection by *filaria* or *Bilharzia* is the usual cause in these places. In rare instances hæmaturia occurs vicariously for menstruation.

The first indication for treatment is to remove, whenever possible, the cause of hæmorrhage. Treatment of renal congestion and inflammation is often the whole treatment for individual cases of hæmaturia. When abnormal blood-states are its cause these require treatment. If menstruation is suppressed and hæmaturia is of vicarious origin, the former must, if possible, be re-established. Renal hæmorrhage due to calculus often cannot be checked until the stone is removed from the kidney by an operation. When inflammation of the kidneys, or the pelvis of them, is the cause of hæmaturia the usual antiphlogistic measures must be employed—such as cupping, leeching, rest, and counter-irritants. If inflammation is due to infection, hot baths (temperature 40–42° C.) are among the most useful measures of relief: they should be repeated daily, and sometimes twice daily. The baths are contraindicated if there is great cardiac weakness or arterial sclerosis. Cupping and leeching cannot be used safely if anæmia or cachexia are great, as they often are in cancer, tuberculosis, and grave pyrexias. When hæmaturia is of traumatic origin an ice-bag on the small of the back and loin is especially useful, and in all cases whenever hæmaturia exists complete rest should be prescribed. Of medicines, astringents are most usually resorted to. By constricting the renal capillaries, it is hoped, hæmorrhage will be checked. Those most frequently used are tannic and gallic acids, perchloride of iron, acetate of lead, hamamelis, chimaphila, rhatany, and krameria. The first four are the most reliable; they are administered by the mouth in the usual therapeutic doses. Ergot can be given with benefit in most cases. It is commonly administered by the mouth, but may be given hypodermically when the stomach is disturbed. Its mode of action is too well known to require repetition. In hæmaturia produced by

calculus, oil of sandalwood, copaiba, or turpentine will often check the bleeding when ergot and astringents fail. They are contraindicated when the renal parenchyma is inflamed.

Medicinal treatment for the endemic hæmaturia of hot countries is of little avail. Astringents, ergot, and balsams are employed, but rarely with much success. Parasiticides have proven equally useless. The best results are gotten from change of climate and constructive treatment and medication. A visit to the cooler part of the temperate zone, or, at least, to high altitudes within the tropics, is most certain to help. Hæmatics and stimulants to nutrition, such as iron, arsenic, quinine, and strychnine, are important adjuvants to climatic treatment. During convalescence sea-baths or hydrotherapy at saline and chalybeate springs prove useful. Not infrequently, although recovery is obtained by change of climate the malady will return if the patient again lives in a hot country. Those who must live in infected districts should exercise the utmost care to use only water that has been purified by boiling and filtration, and foods that are in a wholesome condition, well cooked, and prepared with cleanliness. These are most important prophylactic measures. It is also necessary to avoid excessive labor, and if one is debilitated by slight ailments to endeavor quickly to correct them, for debility from any cause predisposes to infection.

The exciting cause of hæmoglobinuria is renal congestion, but it must be associated with an alteration of nutrition which is either hereditary or acquired. The exact nature of this disturbance of nutrition is unknown. In many cases it is produced by syphilis, malaria, rheumatism, anæmia, excessive nitrogenous waste, or excessive elimination of mineral salts by the urine. The commonest cases of renal congestion are undoubtedly exposure to cold, over-exercise, or excess in venery or abuse of alcoholics. It need hardly be said that when any of these conditions are present the first object of treatment must be their removal. The usual treatment applicable to the predisposing maladies must be instituted. If excessive nitrogenous waste is going on, a milk and vegetable diet should be prescribed and albumins should be used sparingly if at all. Any derangement of digestion that may exist should be corrected. Benzoates and salicylates will help to eliminate nitrogenous compounds in forms as little irritating as possible. Gentle exercise must be commended, but excessive exercise must be forbidden. When there is an excessive elimination of mineral salts by the urine, and consequently a diminished amount in the blood, Robin recommends a diet rich in such mineral matter, and the administration of a powder twice daily of the following complex construction :

	Gramme.
Chloride of sodium	0.3
Chloride of potassium	0.26
Phosphate of sodium	0.06
Phosphate of potassium	0.15
Glycerophosphate of lime	0.03
Glycerophosphate of magnesia	0.017
Sulphate of potassium	0.03
Glycerophosphate of iron	0.062
Hæmoglobin (powder)	0.062

When hæmoglobinuria exists or relapses are feared the patient must be protected by warm woollen garments from sudden chilling; the danger from abuse of alcoholics and excess in venery or in exercise must be explained. Complete rest should be prescribed so long as the urine is bloody. During this time a milk diet is to be preferred. As in hæmaturia so in hæmoglobinuria astringents and hæmostatics are often prescribed, but they are of little advantage, for the underlying fault of nutrition is not corrected by them.

Hæmorrhage from the kidneys is rarely fatal. It often produces great prostration, and may be an important factor in producing death. It is usually of short duration, lasting from a few hours to a week or two. In rare instances it persists for many weeks or months. In one case watched by me it lasted nearly two years and was often very considerable in amount. No treatment seemed of advantage. The patient had a similar attack some years before which lasted about six months. Recurrences of hæmoglobinuria are not uncommon. Hæmaturia, unless its cause can be radically removed, is equally liable to return.

ALBUMINURIA.

Albumin is another abnormal product which often appears in urine. Serum-albumin and serum-globulin are the forms of albumin found in albuminuria. They may appear in the urine because of suppuration or hæmorrhage in the bladder or urethra. When they come from the kidneys they enter the urine almost exclusively from the glomeruli. A small amount of albumin may find its way into the tubules through their walls. When there is intense congestion, inflammation, or profound degeneration or destruction of renal epithelium, always the largest amount—and often all that gains access to the tubules—comes from the glomeruli. If the blood contains an excess of albumin, or if, as Rosenbach urges, there is in it a surplus of loosely united albumin, the latter will find its way from the glomeruli into the urine. Oftener structural changes in the Mal-

pighian bodies, the result of congestion, inflammation, or degeneration, are the causes of its appearance there. In health the serum of the blood percolates through the walls of the capillaries into lymph-spaces outside. The albumin in it is prevented from entering the renal tubules by the epithelium which covers the tufts of capillaries and lines each glomerulus. This epithelium permits the water and certain salts to enter the tubules, but retains the albumin. If, however, because of congestion these lymph-spaces are overfilled, or because of structural changes the continuity of the epithelium is broken, albumin will escape. Not very infrequently a trace of albumin appears constantly, or from time to time, in the urine of those who otherwise seem healthy. Sometimes in such cases no casts, renal epithelium, blood, or other evidences of structural disease of the kidneys can be found and upon autopsy no gross lesion can be detected. These are cases of *glomerular insufficiency*. Usually glomerular insufficiency is of a few glomeruli only, not of all or most of them. So slight may the lesion be that the function of the kidneys as organs of elimination is not interfered with, and the loss of albumin is not enough to cause weakness. These are the cases occasionally met with of albuminuria in persons apparently healthy. Renal albuminuria never occurs if the kidneys are perfectly healthy.

The following are some of the conditions under which albuminuria arises: It is rarely hereditary. Mental and physical fatigue will sometimes cause and much oftener aggravate it. Many diseases which disturb general circulation or profoundly change the quality of the blood will provoke it, such as heart diseases, exophthalmic goitre, deep anæmias and cachectic states. Often both cardiac weakness and a perverted blood-state coexist. In febrile diseases the nutrition of the kidneys, and therefore the permeability of the glomeruli, is modified. Sometimes degeneration or inflammation is the cause of albuminuria of fever. Glomerular insufficiency is produced more readily in some persons than in others. Albumin appears in the urine of a few individuals whenever they eat large quantities of albuminous food; in others it will appear only at certain parts of the day. Such cases belong to the category of cyclic or intermittent albuminuria. The former are characterized by the appearance of albumin at a regular time daily, the latter by its irregular recurrence. In such cases albumin usually disappears from the urine at night, but reappears after two or three hours of ordinary and necessary exercise, or irregularly after more violent exercise or injudicious eating. These are forms of albuminuria that do not affect the general health of a patient and seem not to endanger life; they do signify the existence of weak kidneys, the functions of which are easily disturbed. Glomerular insufficiency increases one's liability to inflammation, and patients

with it should be warned of the danger and taught the precautions necessary to its prevention. Lastly, organic disease of the kidneys causes albuminuria. Indeed, so commonly is it the cause that the existence of an organic disease can be taken for granted when there is renal albuminuria, unless it can be demonstrated that no such lesion exists.

These conditions productive of renal albuminuria give a key to its prevention and often to its cure. Some of the conditions provoking it cannot be removed, as, for instance, chronic Bright's disease. But one can guard against mental and physical fatigue and thus often prevent recurrences of albuminuria, or at least lessen its severity. Anæmias and cardiac weakness can frequently be cured, or at least so far mitigated as to stop glomerular insufficiency. In certain of the milder cases albumin can be removed from the urine by a suitable regimen, and in most cases its abundance can be lessened or augmented by changes in diet. That an exclusive milk diet is the best is almost universally admitted. I have already given reasons for its use when there is renal incompetence. When it is the chief article of food albumin in the urine usually lessens and often disappears. Unfortunately milk is not well tolerated by many patients, especially when they have chronic albuminuria, for its use is then indicated over a long period of time. In milder cases a milk diet is unnecessary, especially when there is not acute nephritis, or an acute exacerbation, and when uræmia is not threatening. In general a diet which embraces a pint or more of milk daily, and most vegetables, breads, and fruits, is permissible. A careful study of the relationship of meats and eggs to albuminuria in individual cases will enable a physician to allow many of his patients some of them. What I say now of diet should be considered with what I have said above of the regimen of the uræmic. What I say now does not apply to those threatened with uræmia, but to those having a mild albuminuria which is not associated with renal incompetence. Albuminous foods should not be taken generously at any time. The least harmful are chicken, turkey, bacon, mutton, and lamb. They are to be preferred in the order named. The most objectionable are beef and game. When meat is eaten it should be simply cooked, without gravies. Meats are deleterious apparently in proportion as they are rich in extractives and are slow of disintegration and digestion in the stomach and intestines. It is best to study the effect of different kinds and amounts of meat in each case by itself.

Can eggs be taken without harm? This is a disputed question. Egg-albumin introduced into the blood directly or absorbed from subcutaneous tissues will undoubtedly produce albuminuria in healthy animals. Repeatedly has albumin been found in the urine of men

who have eaten eggs in too large numbers at one time. This albuminuria is probably due in part to an excess of albumin in the blood, and in part to its being there in "loosely united" forms, or forms unnatural to it. On the other hand, of late, and in growing numbers, clinicians claim that eggs are among the articles of food least harmful in albuminuria. Robin[1] strongly recommends them, but urges that they be always cooked. The question of their hurtfulness must be regarded as an open one. I have permitted some patients to eat eggs and have observed no increase of albumin in their urine, but I have seen in others an apparent transient increase. It is true of eggs as of meat that their effect upon albuminuria should be studied in each case.

The physician who expects to see albumin always disappear from the urine, or lessen in it, when a patient is deprived of albuminous food will often be disappointed. Fish is usually classed among the least harmful forms of nitrogenous food. This is commonly true, and is most true of fish which is fresh and the meat of which contains only a small percentage of extractives. Fish easily spoils or undergoes changes that make it less fit for albuminurics than for healthy people to eat. Farinaceous foods are permissible. They embrace breads, potatoes, turnips, beets, rice, farina, cornstarch, etc. Spinach, peas, and beans are unobjectionable. Usually cabbage, lettuce, asparagus, and tomatoes can be taken. Sometimes the last is contraindicated because it contains oxalic acid, and the others because they are rich in potassium salts. Fruits may be permitted and are most welcome to those who must be dieted strictly.

No beverages are so good as pure water (distilled usually to be preferred) and milk. Tea and coffee in very moderate amounts can be permitted in mild cases. Alcoholics, even the mildest and no matter in how small amounts, are contraindicated. They are irritants to the kidneys and aggravate lesions which produce albuminuria. If given to those who have glomerular incompetence they will increase it. Koumyss is contraindicated because of the alcohol it contains. Matzoon can be used as a food, but it is in no sense a substitute for milk in the treatment of these cases. When milk is the only article of diet at least three or four pints should be taken daily.

A number of medicines are employed to lessen the excretion of albumin. As a restricted diet often fails, so do these medicines. The quantity of albumin passed from the kidney is rarely enough in itself to do much harm. It is not necessary in cases of structural disease of the kidney to address medication to the albuminuria *per se*. When albumin is voided in unusually large amount, and when it is voided without apparent renal lesion, it requires treatment. Astringents,

[1] *Traité de Thérapeutique*, 1896, fasc. ii. p. 98.

given by the mouth, have been chiefly relied upon, such as tannic acid, sodium tannate, hydrastin, uva ursi and its active principle arbutin, and chloride of iron. It is supposed that these do good by affecting the capillaries of the glomeruli. Fuchsin in doses of 2 to 4 grains has been used and lauded by many authors. The lactate of strontium was introduced into medicine by Germain Sée for albuminuria. It is given in doses of 15 to 30 grains three or four times daily. It has been claimed to greatly lessen the elimination of albumin by the kidneys. It is chiefly indicated in chronic albuminuria, and should not be used when there is much danger of uræmia or much fever. How either fuchsin or the lactate of strontium do good is not known. All these remedies I have tried most patiently and in all kinds of cases, but so rarely with appreciable results that I am compelled to trust more to regimen than to medication for the relief of albuminuria. Digitalis, strychnine, and ergot have been employed with the hope that their contraction of the minuter blood-vessels might check the escape of albumin. By increasing blood-pressure they often increase diuresis, and therefore lessen the percentage of albumin in the urine. If they are given in full doses they produce albuminuria in health and increase it when there is renal disease. They act just as ligature of a renal artery does. Cantharides and other irritating diuretics have been used in albuminuria. There is, however, so much danger of provoking nephritis or of aggravating it by them that I am unwilling to use or recommend them. The acetate of lead has been employed, but it is also a provoker of nephritis. If used at all it should be only temporarily, and certainly never by individuals who are gouty or have uric acid diathesis. The astringent properties of this drug are those that commend it.

CHYLURIA.

Chyluria is the name given to a passage of milky urine which contains a large amount of emulsified fat. An admixture of blood sometimes gives it a brown instead of yellowish-white color. Its cause is often the same as of hæmaturia, therefore the two are commonly combined, and blood as well as chyle is found in the urine. It is often intermittent, the chyluria occurring only at night or only by day, or recurring for some days, disappearing, and not reappearing for many days. It is a condition rarely met in temperate climates, but is not uncommon in the tropics. It is due to obstruction of the chyle-channels, the formation frequently of lymphangioma, and finally the rupture of these distended lymph-vessels into the bladder, ureter,

or pelvis of the kidney. In the tropics the presence, growth, multiplication, and at times probably death of the *filaria sanguinis hominis* or *Bilharzia hæmatobium* in the chyle-channels is the common cause of their obstruction. In such cases the immature parasites are discoverable in the urine. The natural tendency in many cases for the urine to lose, at least temporarily, its chylous appearance makes it difficult to judge of the success of drugs in relieving it. The treatment that has been tried and the variety of drugs employed are almost the same as for hæmaturia. In the hands of one observer one drug or combination has proved effective in a given case; another observer has had success with another, and a third has tried them all on a case without effect. I will not repeat the long list of those that have been used. The most efficacious are the following: Astringents, especially tannic acid, ergot, and perchloride of iron, either alone or with opium; the iodides and iodine. The latter probably stimulate the circulation of lymph and re-establish its movements in normal channels by removing obstructions in the chyle-ducts or mesenteric and intestinal adenoid bodies. Reconstructive measures form a third useful means of relief. A change of climate is above all things useful when the condition has a parasitic origin. Cold baths and especially sea-baths are often extremely beneficial. As adjuvants to these modes of treatment iron, quinine, and strychnine prove of value. I need not repeat what I have just written, pertinent to hæmaturia of similar parasitic origin, of the uselessness of parasiticides. Against this form of chyluria the same prophylactic measures must be instituted as for the hæmaturia.

PASSIVE RENAL CONGESTION.

Passive congestion of the kidneys is produced usually by uncompensated cardiac disease, less frequently by diseases of the lungs which cause obstruction to pulmonary vessels, and thereby provoke overwork and exhaustion of the heart. Diseases of the liver, such as cirrhosis, which are accompanied by destruction of hepatic vessels may also produce the lesion. In rarer instances compression of the renal veins by tumors, the gravid uterus, or cicatricial tissue, and thrombosis of them, are its cause.

Passive hyperæmia leads to distention of the veins and capillaries between the tubules and in the glomeruli. When congestion is produced rapidly and is considerable, hæmorrhages into the connective tissues and glomeruli are numerous. The tubules are compressed by the dilated vessels which surround them and in part are blocked

by blood-corpuscles which accumulate in them. In such cases the kidneys are rapidly enlarged. When congestion develops slowly hæmorrhages are rare and small, but capillaries are distended and those within the glomeruli are often ruptured, as is the epithelial lining of the Malpighian bodies, which permits the escape of albumin and often of a few blood-corpuscles. From the intertubular capillaries a serous exudation takes place which produces slight dropsy of the connective tissue. The epithelium of the tubules is at first swollen and later usually degenerated by albuminoid or fatty changes in it. When such congestion is of very long standing the interstitial tissues undergo hyperplasia. This begins just beneath the cortex, about the interlobular vessels, and sometimes spreads deeply into the kidney. When it is considerable atrophy appears, or at least loss of function occurs in the many glomeruli and tubules included in the newly forming cirrhotic tissue. Whatever be the degree, acuteness, or chronicity of the lesion, secretion of urine is diminished both by the circulatory changes and by the narrowed calibre of tubules and obstructions to them by such impediments as blood-corpuscles and tube-casts which are formed when the renal epithelium is much diseased. Glomerular insufficiency, which always occurs in a greater or less degree, produces albuminuria and more or less hæmaturia. The urine may be scant and concentrated, a normal excretion of waste taking place, but oftener the renal epithelium is so involved as to be incapable of performing its full excretory function.

When passive congestion exists, the first attempt at treatment should be to remove its cause. This can often be accomplished by treating cardiac asystole. If, however, structural changes in the liver or compression or obstruction to the renal veins are its cause, a removal of it cannot always be effected. Other conditions than cardiac feebleness are important in the production of passive congestion of the kidneys even when heart disease exists. For the congestion comes and goes and again returns, although the strength, size, and other conditions of the heart vary little. Moreover, in a given case, at one time we observe passive congestion of the kidneys, at another of the liver. Something else than cardiac weakness may cause it to appear at one time in one organ and at another in the other. Just what these conditions are, we do not know.

There is not much danger of uræmia unless nephritis is developed upon the passive congestion. When the alimentary canal contains much toxic material, and the liver is not doing its work well, intense passive congestion may cause uræmia. To avert nephritis as well as uræmia, it is best when passive congestion exists to prescribe a milk diet, to cleanse the stomach and intestines by provoking vigorous peristalsis and free catharsis.

It is important that the secretion of urine be made abundant. Three to four litres of milk daily will usually accomplish this. However, it is often necessary to supplement the action of milk. The citrate and acetate of potash and similar salts are extremely useful, especially when tube-casts and blood-corpuscles are numerous in the urine, for by making the urine alkaline they help to prevent the formation of casts, and to carry into solution the detritus of degenerated cells. In this way they make the renal tubules more permeable. They are also especially indicated when the excretion of nitrogenous matter is lessened, for they directly stimulate the renal epithelium. Lactose, as Germain Sée has pointed out, can also be used with advantage, particularly when milk is not well tolerated. It is administered in solution : 100 grains of lactose in 2 litres of water, the whole to be taken in divided doses during twenty-four hours. It is at times found helpful to add to this solution the acetate of potassium. Lactose especially stimulates the function of the glomeruli. Glucose is nearly, if not quite, as efficient as lactose. Calomel is frequently used as a diuretic. It is sometimes given in moderately full doses, two or three grains daily, for one or two days, at intervals of a week ; or in chronic cases in small doses, a fraction of a grain two or three times daily, and continued for one or two weeks. When given in large doses it is usually purgative and depleting as well as diuretic. Just how it produces its diuretic effect is not fully demonstrated—probably, as Locke[1] has suggested, it increases the amount of urea in the blood ; and no diuretic is more powerful than urea. Furthermore, calomel does good by stimulating the liver which is often functionally inactive when the kidneys are congested, by hastening the evacuation of the upper portion of the intestinal canal, and by acting in it as an antiseptic. Thus it prevents the formation and accumulation of toxic matter, or substances often irritating to the kidneys, in the intestine, and hastens their transformation into inert substances by the liver.

An attempt to lessen the congestion of the renal vessels can often be made with advantage. It is rarely necessary to resort to cupping or leeching the loins unless the congestion is very intense and suddenly developed. But a calomel or saline purge is often of value. Drugs such as digitalis and ergot are given to increase arterial pressure, to thereby force blood through the distended capillaries and veins in more nearly normal quantities. Digitalis is especially indicated when there is cardiac asystole because of its effect on the heart as well as on the blood-vessels. Ergot may be used in the same cases, but seems to be most indicated when passive congestion is due to causes within the abdomen rather than to the heart. Ergot contracts the muscle-fibres in the walls of veins as well as of arteries,

[1] *Practitioner*, xxxvii. p. 170.

and therefore tends by direct action upon the veins to relieve passive congestion.

The iodides of sodium and potassium are employed to favor the flow of lymph from the distended intertubular lymph-spaces. The iodide of potassium strengthens the systole of the heart, lessens general blood-pressure, and therefore makes it easier to effect a balance of arterial and venous blood.

Acute congestion of the kidneys is so usually the first stage of acute nephritis that it is best considered as a part of it. In rare cases it develops and disappears before the inflammation is established. It is then a very transitory affection. This may occur in poisoning by such renal irritants as cantharides, turpentine, and similar drugs, or in poisoning by toxins generated in such infectious maladies as scarlet fever, diphtheria, and pernicious malaria.

INFLAMMATION IN THE KIDNEY.

As in the lungs or respiratory passages, inflammation in a kidney may affect only certain portions or structures of the organ, or affect them chiefly. Usually all the structures are somewhat modified, but either the glomeruli or the tubules or the interstitial tissues are chiefly affected. When renal inflammation is *acute* it produces *glomerular* or *catarrhal nephritis*. In the first instance the glomeruli and tissue immediately about them are almost exclusively modified; in the second the epithelium of the renal tubules is chiefly changed. When it is chronic two forms are clinically recognizable; chronic diffused or parenchymatous nephritis, and interstitial nephritis or renal cirrhosis. The former sometimes follows acute nephritis, and sometimes arises as a chronic affection. It is characterized chiefly by degenerative rather than inflammatory changes. In chronic interstitial nephritis all tissues of the kidney are involved, but the interstitial tissues are so much increased in amount that they form its most striking anatomical feature.

The effects of acute congestion and acute inflammation are to lessen the outflow of urine, to change its character, and, when inflammation is at all intense, to produce general anæmia and œdema, sometimes also uræmia in its varied forms. Pyrexia rarely accompanies acute inflammation of the kidneys, and is not high or of long duration.

The urine is lessened because the glomeruli and tubules are choked, and the latter often are also compressed. The glomeruli are filled, especially when the nephritis is of the glomerular variety, with desquamated epithelial cells which accumulate within Bowman's capsule

so as to compress the tuft of capillaries. The latter are usually distended, as far as compression will permit them to be, with blood. Extravasations of it also often partly fill the enlarged glomeruli. In other cases the glomeruli and peri-glomerular tissues are filled with leucocytes which compress the capillaries, distend Bowman's capsule and crowd the lymph-spaces in the surrounding tissue so as often to compress the adjoining renal tubules. It is easy to comprehend how such glomerular changes will make the urine scant. Before they develop, the afferent vessels and glomerular capillaries are usually deeply congested.

When there is acute catarrhal or parenchymatous inflammation the renal tubules are choked partly by blood from the glomeruli, providing very acute congestion precedes the inflammation, and by the epithelial cells so swelling as to nearly close the tubes. At the same time the cells become granular and loosened from the wall of the tubules. When thus loosened, and sometimes even before they have been cast off, they disintegrate. They and the granular detritus produced by their disintegration block the tubules completely in places. The calibre of the tubes is also partly obstructed by numerous casts which are elaborated from cells undergoing disintegration or degeneration. These are the most important ways in which occlusion of the tubules is produced, but congestion of the vessels between the tubules, distention of the lymph-spaces there, helps to cause it. These changes are most pronounced in and about the convoluted tubes and in the mild cases are confined to them. Both glomerular and tubular changes coexist, but in individual cases one may greatly predominate over the other. If acute catarrhal inflammation lasts for two, three, or more weeks the tubular epithelium becomes more coarsely granular and the cells disintegrate in larger numbers, filling the tubes with granules of fatty matter, for it is fatty degeneration which the cells undergo. In some cases, at this stage, just under the capsule of the kidney and about the interlobular vessels small areas of cirrhosis form. The period of degeneration may be prolonged over months and constitute one form of chronic parenchymatous nephritis. It is still the convoluted tubules which are chiefly affected. It is important to note that only a few of the cast-off cells, and a small amount of extravasated blood and granular débris finds its way into the loop of Henle. It is rare that any can be discovered in the ascending arm. So much of these substances as is recovered from the urine comes mainly from the tubules below the narrow loop of Henle. A little must find its way through, especially if the urine is alkaline and the granular matter and casts are thereby made more soluble and smaller. When recovery takes place the fat-granules are absorbed and fill the lymph-spaces in the interstitial tissues; new epithelium is rapidly reproduced; the

glomerular lesions also disappear, and repair may ultimately be perfect.

The urine is changed in character by the presence in it of abnormal ingredients and by diminished amounts of normal ingredients. The abnormal ingredients are albumin, blood, casts, and epithelial cells. The relative proportion of these various ingredients in the sediment of the urine gives one a key to the character of the renal inflammation in a given case. If blood-corpuscles and blood-casts are especially abundant we can justly conclude that congestion is great and hæmorrhages numerous. If epithelial casts and loose epithelial cells form the bulk of the sediment we know that it is a catarrhal nephritis with which we have to do. If albumin is abundant, casts moderate in number and mostly hyaline and granular, red blood-corpuscles present in small or moderate amounts, and epithelial casts and cells almost or quite wanting, we can conclude that the case is one of glomerular nephritis.

Urea, uric acid, and other soluble bodies usually excreted in the urine are diminished in amount whenever the renal tubules are much affected. As the urine is commonly much diminished in amount, the percentage of these ingredients in it may be increased, although in twenty-four hours they may be eliminated in amounts much less than normal. We possess no evidence so good as this of the extent to which the kidneys are involved. If a normal amount of urinary excreta is found, although the quantity of urine is small, we know that the epithelium is for the most part intact and doing its work.

These symptoms are guides in applying drugs to the treatment of nephritis, and will help to explain their mode of action. The suppression of urine leads to, or may threaten, uræmia. Coincidently the modification of the blood and of the normal functions of capillary walls produces dropsy. Pericardial, pleural, or pulmonary œdema may cause or materially aid in causing death. Nephritics are especially liable to bronchitis and pleurisy, which are also at times fatal complications. The first indication for treatment is to guard against these complications. Rest in bed and a uniform temperature about the body are of the greatest importance to accomplish this. If, with such care, a suitable diet is prescribed, many of the mildest cases can be conducted to recovery without medication. Exercise will so augment waste products in the blood that the danger of uræmia is increased. Dropsy can also be made to disappear more promptly if one is in a recumbent position. A safe rule is, therefore, to keep a patient in bed so long as the daily flow of urine is less than normal, and so long as there is œdema. It is of great importance that the skin be not suddenly chilled and that its function of elimination be encouraged. The temperature of the room in which acute nephitis

is treated should be kept at from 70° to 74° F. The air is to be kept fresh by ventilation. The patient must be protected from draughts. Woollen clothing next the skin helps to protect it and to encourage its functional activity. To promote the latter, either warm tub- or sponge-baths are useful. They should be followed by brisk rubbing which will both dry the skin and make it glow.

The diet must be such as the prevention of uræmia and the existence of albuminuria demand. This has already been described. Milk is to be used exclusively if possible.

To increase the flow of urine requires that (1) renal congestion be relieved, (2) the tubules be kept permeable, and (3) absorption by the renal lymphatics be promoted. In severely acute cases of nephritis active congestion may cause almost complete suppression of urine, aching in the back and loins, and usually mild or pronounced uræmia. Local depletion, and in the severest cases venesection, are the most efficacious means of relieving congestion. It is rare that bleeding is necessary. It can be best effected by moist cups or leeches. In milder cases dry cups and fomentation are sufficient. Fomentations alone will answer in the mildest cases. Poultices should be large so that they will cover the back from the shoulder-blades to the sacrum and come around the sides of the abdomen.

When the urine is very scant, highly albuminous, and bloody, digitalis is indicated. It will increase the flow of urine by increasing blood-pressure, and will contract the vessels, lessen hæmorrhage and the escape of albumin. Ergot, the perchloride of iron, and other astringents are rarely required in cases in which hæmorrhage is great.

Congestion can also be relieved by catharsis. Salines or calomel purges should be given at the onset and repeated daily or frequently. They aid in relieving renal engorgement, in preventing and relieving uræmia, and in removing dropsies.

It is most necessary to help to keep the renal tubules permeable in cases of acute catarrhal nephritis, for in these the tubules become most blocked with epithelium, casts, and the detritus of disintegrated cells. In cases of glomerular nephritis obstruction to the tubules is less, but not wanting. By keeping the urine alkaline, casts are formed in smaller numbers, are partly dissolved, and much of the granular matter is carried into solution. Alkaline diuretics will make the urine alkaline and therefore help to keep the renal tubules permeable. The salts most frequently used are the citrate, acetate, and bitartrate of potassium. An ounce a day, dissolved in water, is a common dose of either of them; often smaller amounts will accomplish the desired results. A physician should be guided by the reaction of the urine as to the dose which he will continue after the urine is once made alkaline. To maintain alkalinity the drugs should be given in

divided doses once in two or three hours. Copious draughts of water should also be given to promote diuresis and to wash the tubules of their contents.

Mercurials are important remedies in these cases, for in small doses given for several days in succession they will increase diuresis and the elimination of nitrogenous matter, and will as an alterative promote a better flow of lymph, the absorption of interstitial exudates, and even of foreign matter in the convoluted tubules. They are especially indicated in catarrhal cases. Calomel is usually preferred to other salts of mercury. A quarter of a grain or less should be given three or four times in twenty-four hours for as many days.

It is quite as essential that the quality of the urine should be improved as that it should be increased in quantity. When the urine is greatly lessened in amount and uræmia is present or imminent, to increase its quantity is most urgent, and for the time its quality may be neglected. To improve its quality is a prominent object of treatment in subacute and convalescing cases. Alkaline diuretics are chiefly relied upon to increase elimination of nitrogenous matter, but lithium benzoate and similar drugs may be employed. Albuminuria and hæmaturia modify the quality of the urine. Their treatment has already been described.

The treatment which is essential for uræmia and the renal congestion will help to eliminate dropsies. When there is anasarca only, and especially when it is moderate in amount, catharsis helped by diaphoresis and increased diuresis constitutes an efficacious treatment. Salines are often given daily to hold œdema in check or help to eliminate it. They can accomplish this best if given to an empty stomach in concentrated solution. No fluid should be taken until they have produced copious watery movements. A large amount of fluid may be withdrawn from dropsical tissues in this way. But if copious draughts of water are taken with or immediately after the saline purgative, the latter only hastens its absorption from the stomach and influences the dropsy little or none.

To promote diaphoresis hot tub-baths may be used in mild cases and hot-air baths for those unable to be moved from bed. Often a hot pack will provoke free sweating and with much less discomfort or exhaustion than a hot tub- or hot-air bath. By a hot pack is meant enveloping a person in a sheet dipped in water as hot as can be tolerated, immediately after which he is covered heavily with blankets. When anasarca is very great and does not lessen under the treatment just outlined, puncture of the œdematous tissue will give relief. This is accomplished by introducing in many places in the lowest portions of the œdematous tissues minute cannulæ. It, however, seems preferable to me to make a single incision over the malle-

olus of each ankle, an inch long and almost deep enough to touch the bone. If after this a rubber sheet is so placed under the patient's legs as to conduct the water away, and if the head of the bed is raised so that the fluid will gravitate to the feet, all the subcutaneous tissues can be emptied in a few hours. This method is especially adapted to those who are strong enough to sit up.

In acute nephritis vomiting is often persistent and frequent at the outset. It makes the administration of drugs and of water almost an impossibility. It is best relieved by lessening renal congestion and preventing uræmia. Cups, leeches, fomentations to the back, sulphate of magnesia hypodermically, or two or three drops of croton oil diluted with sweet oil upon the tongue or *per rectum* to deplete the kidneys, will lessen the irritability of the stomach more than anti-emetics. What has already been said of the treatment of vomiting in uræmia is applicable here.

Fever which occurs in acute uræmia, caused by cold or poisons absorbed from the alimentary tract, does not require special treatment. Chemical antipyretics are uniformly contraindicated. They increase the disorganization of the blood, many of them are renal irritants, and not infrequently when the kidneys are acting imperfectly therapeutic doses of them produce unfavorable effects—even fatal collapse. When nephritis threatens or arises in the course of infectious febrile diseases the bath-treatment which must be relied on for their relief can be continued. This and a proper diet are the best measures for the prevention of nephritis. Cold baths do not aggravate it when it is established.

During convalescence the greatest care must be taken to prevent relapses. Changes in the temperature of the room, clothing, and diet must be effected gradually and slowly. Exercise can be prescribed only with caution. The urine should be constantly watched as these changes are made. If the changes increase albuminuria or diminish the excretion of urine or cause albuminuria or œdema to return, they must be stopped or made more slowly.

Acute nephritis, if at all severe, produces marked anæmia which requires treatment during convalescence. Iron and bitter tonics, such as quinine and strychnine, will be found beneficial. So soon as the patient is well enough to take advantage of it an out-door life in a warm genial climate will complete the cure and stimulate repair better than medicines. This often necessitates a change of climate. It can be avoided, but is desirable if it can be afforded.

Something must be said of the prevention of acute nephritis. In the treatment of those infections which are often complicated, or followed by, nephritis, such as scarlet fever and diphtheria, a milk diet or when it cannot be taken a suitable substitute for it, with cleanliness of the

alimentary canal and skin, and an abundance of pure genial air to breathe, are the most efficient preventives. Much of what has already been said of the prevention of uræmia might be repeated here. Abuse of alcoholics, gourmandizing, exposure to cold and dampness, are at times avoidable exciting causes of acute nephritis.

Chronic parenchymatous nephritis or **chronic diffuse nephritis** can be regarded as a degenerative renal lesion rather than as an inflammatory one. It is true that it often begins as an acute catarrhal inflammation, but when it becomes chronic, fatty degeneration of renal epithelium is its most characteristic lesion. It is also true that the interstitial tissues are somewhat thickened and the glomeruli are modified in structure, but the gross as well as the most striking microscopical appearances are produced by fatty changes in the renal epithelium. The tubules are obstructed with cast-off cells, cellular débris and casts. Many of the glomeruli are made functionless by thickening of their capsules and by hyaline changes in them and the capillaries. The interstitial tissues are slightly increased in amount and apparently thickened by distention of their lymph-spaces with fat absorbed from the convoluted tubules and often by serous exudates. The functional incapacity of the kidney is the same as in acute catarrhal nephritis. The same indications for treatment exist, plus such treatment as the degenerative changes and chronicity of the lesions may demand. In rare instances the disease persists for many years. Interstitial hyperplasia may then predominate, the kidney contracting and all the phenomena of interstitial nephritis developing as a sequel to chronic diffuse nephritis. Chronic nephritis is liable to acute exacerbations, which for the time resemble symptomatically acute nephritis. A few cases are denominated chronic hæmorrhagic nephritis, because of profuse, persistent, or recurring hæmorrhages.

A diminished excretion of urine and urinary solids, and a tendency to fatty degeneration of epithelium demand correction. Uræmia is common. It is, however, usually chronic in form. Acute uræmia is much less common in this than in any other form of nephritis. If it does occur it is generally when there is an acute exacerbation of the disease, or when the stage of contraction is reached. Œdema is, with rare exceptions, an early and marked symptom. When it has once appeared it seldom wholly disappears, or if it does it reappears soon. It is, however, subject to great variation from time to time. Anæmia is also present, which with malnutrition produces an earthy, grayish color of the skin. In hæmorrhagic cases anæmia may be more profound and cause a clearer pallor. Digestive disorders may arise as complications, but are oftener due to mild uræmia. Strength and flesh are gradually lost.

It must not be forgotten that a group of cases of chronic albu-

minuria exists unaccompanied by loss of strength, anæmia, uræmia, or diminished excretion of urine, in which there is sometimes a large, sometimes a small percentage of albumin voided. The urinary sediment is very small in amount, contains few or no cells, no renal epithelium, a few hyaline and finely granular casts. As a rule these patients feel well and may continue so during a long lifetime. They often finally succumb to an intercurrent disease. While such persons must be looked upon as suffering from the most benign of chronic renal maladies, that they have diseased kidneys and are prone to develop more serious trouble in them must be recognized.

Apoplexy, hemiplegia, and retinitis are not common complications of chronic diffuse nephritis. The dangers which must be averted are acute exacerbations, uræmia, œdema, or inflammation of serous sacs or of the lungs or heart. The prophylactic measures applicable to acute nephritis are equally applicable to acute exacerbations of chronic nephritis, and have already been described; so, also, has the prophylaxis of uræmia. Measures which lessen œdema or hold it in check are the only ones which will lessen a tendency to dropsy of serous sacs. Protection from cold and dampness by warm clothing and dry dwellings, or better still by a residence in warm equable climates, is most certain to prevent inflammatory complications such as endocarditis, pericarditis, or pleurisy. Those who suffer from chronic nephritis should make a permanent, or at least a winter, residence, if they can afford it, in a genial, equable, and dry climate, such as exists in western Texas, Arizona, or southern California. The dryness of these regions increases the elimination of fluid by the lungs and skin and thus helps to diminish œdema. If there is no œdema a warm winter climate will be sufficient, such as can be found in most of our Southern States. If there is much œdema a climatic change is not indicated; for a patient is then too feeble to take long journeys, and the comforts of home are essential to his well-being.

The treatment already described for acute nephritis is applicable to chronic diffuse inflammation of the kidneys so far as drugs are required to promote diuresis. If, as happens now and again during periods of remission in the disease, the urine becomes normal in amount, normal in specific gravity, and œdema disappears, diuretics should of course be discontinued. Treatment of albuminuria can then be tried. The hæmaturia of hæmorrhagic cases must be overcome by the remedial agents described above. Œdema is more persistent than in acute cases, and treatment seems less efficacious. For its relief, as in acute nephritis, diuretics, cathartics, and diaphoretics must be used. Ankle-incisions must oftener be resorted to. By these, if the œdema has not been of too long standing, perfect drainage will be effected, but if the œdema has been very chronic the subcutaneous and inter-

stitial tissues will have become thickened by cell-proliferation and the lymph-spaces will thereby be partly occluded; the normal free and almost universal anastomosis of lymph-spaces will be destroyed. For this reason, also, the making of ankle-incisions repeatedly will form a less and less efficient mode of draining the tissues as time passes. Drainage can be made more perfect in such cases if before the incisions are made vigorous massage is practised. It should be practised so long as the incisions are open and serum flows from them. I have seen great relief afforded by the repetition of incisions three and four times, at intervals of a month or two. It is rare, however, that they prove very effective after the second time.

Considerable dropsy of the pericardial sac demands the removal of the fluid by aspiration. Pleural dropsy rarely endangers life. At times it may form a serious lesion and will require aspiration. Before these forms of dropsy develop the more usual treatment for œdema has generally been thoroughly tried and failed. Aspiration then becomes a necessity so soon as enough fluid accumulates in the pericardium or pleuræ to endanger life.

In even mild cases warm baths should be taken frequently to increase the activity of the cutaneous glands. They should be taken every fourth or fifth day. If uræmia exists, the hot bath or pack may be used daily. Serous, cardiac, and pulmonary inflammations require the treatment appropriate to them under other conditions. When they complicate nephritis they make the prognosis especially grave.

Fatty degeneration has been described as the characteristic lesion of this malady. It is best combated therapeutically by those measures which improve nutrition. It is in this class of cases that iron is of especial service. It must often be given for months at a time. The best results are obtained by a change of preparations from time to time, and by the use of those only that are least irritating to the stomach. My own preference has been for the citrate and potassio-tartrate of iron, ferratin, and desiccated blood. Moderate doses will give as good results as very large ones. Of medicinal agents iron may be regarded as the one constantly applicable. Oxygen is given by inhalation with the hope that it will promote more perfect metabolism. It is well known that no more oxygen can be taken by blood-corpuscles from pure oxygen gas than from air. How, therefore, can it do good in nephritis? Clinical experience has seemed to me to demonstrate its inutility unless there is obstruction to respiration by bronchitis, asthma, œdema of the lungs, or similar affections. Whenever aëration of the blood must be effected in an unusually small area of lung-tissue oxygen is of great value. Although oxygen is of little use, fresh air—if possible, out-door air—sunshine, and cheerful surroundings are of great value, as they stimulate better nutrition.

Although in acute nephritis a patient is best kept in bed so long as there is œdema, the same rule cannot be enforced in chronic cases. If œdema is not considerable, gentle exercise, not too long continued, is wholesome. When œdema interferes with walking or is much increased by even short walks, massage may be substituted for active exercise. Massage should be practised with care that the patient may not be made too weary and tissue-waste unduly augmented.

An abundance of pure water should be constantly taken as a diuretic. Many patients are benefited by a visit, for one or two months annually, to springs like those at Waukesha in Wisconsin. The change of scene, of food, of air, of life, stimulates the patient, encourages hopefulness, and improves nutrition. At such places hot baths are taken often and with regularity. Several quarts of water are usually drunk daily, for at a spring a patient will drink freely of a water which they will only use sparingly at home. The example of many drinking at the spring inspires each one to imbibe freely. Springs must be chosen which are in pleasant country towns, where appropriate foods can be readily obtained, and where the waters are peculiarly free from both inorganic and organic matters.

During periods of acute exacerbation a milk diet should be maintained if possible. At other times a diet of non-nitrogenous food with milk as a staple should be prescribed. Amylaceous foods and fruits are the best. If the kidneys eliminate a normal amount of nitrogenous matter and water, and if œdema is gone or trifling, a little of those albuminous foods already described as least harmful in albuminuria may be permitted. Their effect upon the quantity of albumin in the urine should be constantly watched. If they increase it, they must be interdicted.

Mercurials are useful in this form of nephritis for the reasons already assigned for their employment in the acute form of the disease. They are usefully employed intermittently, for perhaps a week at a time.

Even if cathartics are not indicated by lessened urination or œdema, they should be given often enough to prevent the accumulation of much fæcal matter or the products of intestinal fermentation.

If the renal lesion is being transformed into a cirrhotic one, mercurials are supposed to be indicated because they often modify plastic inflammation, help to bring about a resolution, and prevent interstitial hyperplasia. Undoubtedly in all stages of the disease the tendency of the drug to stimulate the flow of lymph helps to free the interstitial tissues of the kidney of detritus of disorganized cells absorbed from the tubules. The removal of this with greater rapidity will lessen the tendency to hyperplasia about the lymph-spaces and blood-vessels. The iodides have sometimes been used in the same

cases and for the same purposes, but they can rarely be used efficiently, for they disturb digestion.

The heart may undergo hypertrophy even in the early stage of this malady, but usually such changes only occur after the kidney becomes cirrhotic. The heart grows feeble in proportion as nutrition is impaired and general strength is lost. Cardiac weakness is often increased and sometimes precipitated by endocarditis or pericarditis. A rapid, feeble action of the heart is common in all severe cases and increases dropsy. Cardiac tonics are then demanded. The best are digitalis and strophanthus.

Amyloid infiltration of the kidneys and chronic diffuse nephritis are commonly associated in varying proportions. The lesion of amyloid infiltration and its location is so well known that it requires no description. Unfortunately we do not know its exact mode of production. No known treatment will produce resolution in the tissues in which amyloid deposits have taken place. Treatment must therefore be directed rather to the coincident parenchymatous changes, and does not differ from that of chronic diffuse nephritis. In rare instances recovery has taken place when the lesion was not of long standing, or improvement has occurred in more prolonged cases by removal of the conditions under which amyloid infiltration takes place. When, as oftenest is the case, chronic suppuration is its cause, complete drainage of the abscesses may check the amyloid disease. So surgical treatment of chronic destructive osteitis or periostitis may check or bring about spontaneous recovery from amyloid disease. It is common in cachexia from tuberculosis, syphilis, and leukæmia. Treatment of these diseases may check its progress, and in the case of syphilis rarely effect a cure. Usually these diseases are incurably fastened upon a patient before amyloid infiltration occurs.

Interstitial nephritis, or renal sclerosis or atrophy, is the most chronic of all the renal affections. It is impossible to fix its exact time of onset, so insidious is its beginning and development. It may exist for five or twenty-five years. The first is probably the commonest length of its course.

It is characterized by a destruction of glomeruli and renal epithelium, morsel by morsel. Except where minute particles are destroyed the renal tissue is sound. The glomeruli involved atrophy, the tuft of capillaries shrivels or disappears, the capsule thickens and contracts. The epithelium of the tubules grows small, disintegrates, disappears, and the tubule is obliterated by hyperplasia of connective tissue which takes place as atrophy advances in the tissues functionally important to the organ. Endarteritis and often obliterating endarteritis occurs in the affected regions. Although the lesions spread very slowly they finally destroy much of the secreting power

of the kidneys. As in other than the affected parts of the organs glomeruli and renal tubules are normal, less change is wrought in the character of the urine than in the other varieties of Bright's disease. And as the kidneys atrophy gradually, during many months and often many years, the individual will as gradually lose flesh and, less perceptibly but quite as surely, strength. Loss of flesh is generally not considerable. It is so slow that it is rarely looked upon as pathological. Digestive disorders, headache, or uræmic symptoms usually first call for treatment. The existence of the disease is not unfrequently overlooked until acute uræmia demonstrates it and causes sudden death.

Atheroma or general endarteritis is associated with renal atrophy in many cases, and is often the cause of the renal changes. In minute areas, because of the imperfect supply of blood through the narrowed arterioles, atrophy occurs, and connective tissue hyperplasia, which is the correlative of atrophy of highly differentiated structures, develops. But all cases are not the result of arterio-sclerosis. In some instances destruction of renal tissue morsel by morsel is probably effected by chemical irritants or poisons ingested, made in the intestinal tract or tissues, which act intermittently rather than constantly. When renal atrophy has occurred the heart must hypertrophy and blood-tension must be raised to make that portion of the kidneys which is still active capable of eliminating a normal amount of waste. High arterial tension and cardiac hypertrophy are quite as much a part of the disease as renal atrophy. If there is generalized endarteritis it also will lead to enlargement of the heart and arterial rigidity. Occasionally the lesions of chronic diffuse nephritis precede and rarely are superimposed upon those of the chronic interstitial form.

The physiological results of this renal atrophy are elimination of urine in increased amounts. This is due to high arterial pressure and a healthy condition of numerous glomeruli. Those Malpighian bodies which are destroyed are impermeable; those in the process of destruction, which are few at any one time, produce the minute amount of albumin that is found in the urine. As the destruction of renal tissue often goes on intermittently, albumin is many times a variable ingredient in the urine. In the early stages when disease involves only a very few tubules and only minute areas in any one, casts and cells may not be discoverable in the urinary sediment. Later in the course of the malady, and especially if its slow course is slightly quickened, a few hyaline or finely granular casts will be discoverable. Renal epithelium and blood-corpuscles are almost constantly absent. Casts and cells are more abundant in the third stage of the disease when the heart is dilated and weak, and when the balance between arterial and venous circulation is destroyed. Although the quantity of urine

is greater than normal so long as the heart is strong, the quantity of nitrogenous matter eliminated is only normal or less; therefore the urine has a low specific gravity. It is lowest when the kidneys are much atrophied and the heart is still strong. Its percentage may increase and the quantity of urine may diminish when the heart flags, but even then the quantity voided in twenty-four hours is often subnormal. The great danger of uræmia is evident. This danger is increased by coincident indigestion, intestinal fermentation, sluggish action of the liver, and therefore imperfect metabolism. Uræmic coma is commoner in this form of Bright's disease than convulsions. Acute uræmia, even fatal, often occurs without premonition and unexpectedly; chronic uræmia is also common. Pressure suddenly increased within arteries that are atheromatous frequently causes their rupture; cerebral apoplexy is therefore a not uncommon complication of interstitial nephritis. It is the immediate cause of death in many cases. Hæmorrhages may occur into the retina and produce blindness or blurred vision, or it may be into other tissues. Whenever extra work is continuously demanded of the heart it hypertrophies, providing it is well-nourished; it cannot, however, by hypertrophy keep pace indefinitely with the increasing demands for work, therefore if a patient is not killed by uræmia, apoplexy, or some intercurrent trouble, the natural termination of the malady is cardiac weakness, dilatation, and all the changes characteristic of asystole.

The most important indications for treatment of renal atrophy are (1) if possible to remove the cause of it, that the disease may be stopped in its progress; or, if that is impossible, (2) to avert the commonest fatal complications, such as uræmia, apoplexy, and cardiac exhaustion, that the course of the disease may be prolonged. These complications are least liable to occur in the earliest stages of the malady; it is therefore important to recognize interstitial nephritis in its incipiency and to meet the indications early.

The disease is eminently one of mature life, death from it occurring almost exclusively between the fortieth and seventieth, and oftenest between the fiftieth and sixtieth years. It is between thirty-five and fifty that its beginning must be sought in those who by disposition, disease, or mode of life are liable to it. So often does it complicate the uric acid diathesis that atrophied kidney is frequently spoken of as gouty kidney, especially in those countries where gout is common. It is therefore important in a very large number of cases to employ as prophylactic measures those that must be used for gout. The diet should be simple, rather abstemious; especially should large quantities of meat be proscribed, and highly spiced or seasoned food. Alcoholics should not be used. Pure water should be drunk freely. If possible an out-door life should be led and exercise enough taken

to maintain active and complete tissue-change. Indigestible foods must be avoided. Digestive disorders must be promptly corrected. Whether it is uric acid or some other less well known ingredient of the blood that provokes renal atrophy we do not know. If it is not uric acid, it is something which increases in the blood simultaneously with it. Chronic lead-poisoning can produce the same lesions as gout, and can, indeed, provoke the latter. Lead salts should not be employed as medicine in this disease, and accidental lead-poisoning should be prevented. Syphilis undoubtedly produces a few cases of renal atrophy. Sometimes its specific treatment will check the progress of the disease or even prove curative. Chronic malaria is a much less common although undoubted cause of it. Quinine may have quite as curative an effect in such cases as mercurials in syphilitic ones. We know of no way to combat with certainty atheroma, which is so common a cause of chronic interstitial nephritis. Good hygiene, freedom from mental and physical over-exertion, and life in a bland, genial climate will most surely prolong life in such cases.

Uræmia in interstitial nephritis is the result sometimes of such destruction of renal tissues that normal elimination can no longer be maintained. Much oftener it is due to partial renal incompetence and to accumulation in the blood of products of intestinal fermentation and of imperfect metabolism. The treatment of uræmia has already been described. It is important in these very chronic cases to instruct patients to watch carefully the quantity of urine voided. This can only be done by measuring all that is eliminated in twenty-four hours. Such measurements of the urine should be made once in seven to ten days during the earlier part of the disease's course and oftener in the later part. After a few measurements and simultaneous analyses the quantity that must be secreted by the individual, in order that a normal elimination may take place, can be ascertained. Whenever he finds that he is making less, he should be instructed to call upon his physician for a modification of diet, or diuretics may be needed. It is well to inform him what are the common symptoms of mild uræmia that he may place himself under treatment so soon as they arise. The need of clean intestines and freedom from indigestion should especially be explained. When uræmia threatens, a strict diet, such as has been described, must be employed, but during most of the long course of this disease the diet can be varied almost as it would be in health. A patient should eat less, especially less of meats and of rich and highly spiced or dressed foods. Those articles that are most inclined to ferment in the alimentary tract should be avoided. Alcoholics should be interdicted. Water must be taken freely. Exhalation from the skin should be promoted by warm baths and friction.

The second group of dangers—cerebral hæmorrhage and cardiac exhaustion—arise from high arterial tension. If arteries are atheromatous it is especially necessary to lessen arterial tension and to prevent a sudden increase of it. Digestive disorders and constipation are the commonest causes of high tension. The frequent—or, if necessary, the constant—use of laxatives will empty the intestines and lower arterial pressure. Food and medicine must be adjusted to prevent slow digestion and fermentation within the stomach. Over-exertion, either mental or physical, will increase arterial tension, and must be avoided. While prolonged and violent exercise is interdicted, gentle exercise is a necessity to maintain good lymph-circulation and good metabolism.

To suddenly chill the surface of the body will disturb nutrition, temporarily increase arterial tension, and will often excite in the nephritic, who is particularly liable to inflammation of the organs of respiration, dangerous bronchitis, pleurisy, or pneumonia. Careful protection of the skin by woollen garments is therefore necessary. If possible, these patients should not live in damp, changeable climates, at least not during the inclement seasons.

Nitrites can be employed from time to time with advantage to lower blood-pressure. Nitro-glycerin and sodium nitrite are the preparations to be preferred. They are often prescribed for weeks at a time. Some individuals cannot use them, for they are apt to produce uncomfortable headache when employed in full doses. The tinctures of veratrum or aconite with sweet spirits of nitre may be prescribed in their place. The iodide of potassium also lessens arterial tension and can be used for long periods of time more comfortably than the nitrites. It does not relax the arterioles to the same extent, but produces a more prolonged effect, and therefore does not need so frequent repetition. It too cannot be used by certain individuals because of their susceptibility to iodism, or because it disturbs their digestion. When the heart is hypertrophied and arterial tension is high, digitalis, strophanthus, their congeners, ergot and strychnine, are contraindicated.

In the last stage of the disease, when the heart grows weak, the kidneys act less freely, and œdema develops, the danger of uræmia increases and must be averted with redoubled care. The pulse grows small, is softer and quicker. Strophanthus can now be used advantageously to temporarily strengthen the heart and increase diuresis. Even digitalis can be employed with safety. Iron and bitter tonics are useful to stimulate nutrition. Rest and a milk diet, or at least a non-albuminous one, are a necessity. Alkaline diuretics, cathartics, and diaphoretics must be used often or constantly to avert uræmia and to hold in check or to lessen œdema.

Such drugs as the iodides, mercurials, and double chloride of gold and sodium have not infrequently been employed in renal atrophy, hoping thereby to lessen the formation of new connective tissue. I believe the latter of them has been generally discarded as useless. I have obtained no perceptible results from it. The good effect of the iodide of potassium must be assigned to its influence upon blood-pressure rather than to its alterative properties. The mercurials do good as intestinal antiseptics and diuretics. Moreover, the renal atrophy is not to-day thought to result from connective-tissue hyperplasia. The latter fills a gap caused by atrophy and disappearance of normal tissue. It is a general law of pathology that such hyperplasia occurs whenever neighboring highly differentiated structures are destroyed. There is therefore no reason why the increase of renal connective tissue should be combated. It is destruction of tissue peculiar to the kidney that must be prevented.

Pyelitis may be acute or chronic, and treatment must be adapted to each state.

ACUTE PYELITIS is commonly due to stone in the kidney's pelvis. It may be caused by toxic agents which are eliminated by the kidneys during fevers. As a rule, this latter form is a mild affection which disappears spontaneously when fever subsides. Acute inflammation of the renal pelvis may also develop by extension of blennorrhœa or other suppurative disease from the lower urinary organs. It is evident that prophylactic measures can be successfully instituted against only a part of these causes. If a stone exists and is a constant source of irritation, it must be removed to effect a cure. Pyelitis which accompanies fevers can be prevented or lessened in intensity by a milk diet, copious draughts of water, and hydropathic treatment, for by these means the urine will be diluted and become less irritating. Whenever the urinary channels are infected, especially when the bladder is, as speedy a cure as possible must be effected to prevent the development of pyelitis by extension of infection. In such cases the bladder must be emptied frequently and perfectly. For if urine is long retained and the bladder is distended, the chances of extension of disease to the kidney are greatly increased.

When acute pyelitis is detected, local depletion will often give much relief to the pain in the back which the patient usually feels, and will shorten the course of the inflammation. It is best effected by leeches or cups over the kidneys. In mild cases counter-irritants can be substituted for these measures. Fomentations applied to the back after local bleeding or counter-irritation will prolong their good effects. Depletion can also be accomplished by catharsis. Drastic or calomel purges are to be preferred to salts. The latter are in part eliminated by the kidneys and are slightly irritating to the pelvis and

bladder. Not only do these remedies deplete but they also remove from the intestinal canal materials which would otherwise be absorbed, eliminated through the kidneys, and prove irritating to them.

It is also necessary to make the urine thin and bland, that it may be as little irritating as possible to the mucous membrane of the pelvis of the kidneys. This is best accomplished by encouraging copious libations of water and by a milk, or at least a liquid, diet.

In the more severe cases pain in the loins is hard and requires relief. Generally local depletion and fomentations will mitigate or remove it. The latter can be made more anodyne by adding to them opium or belladonna, or both. The tinctures of these drugs can be mixed in a poultice, or belladonna-leaves can be added to the flaxseed which is used in its composition. If pain cannot be relieved by these measures, morphine or codeine must be given by the mouth in sufficient doses to accomplish this.

Antiseptics have been administered *per os*, with the hope that they would lessen or prevent suppurative pyelitis. They have proved of little use, and by many are no longer employed. Those that have been most used are salol, naphthol, and resorcin. All the antiseptics that have been tried are more or less irritating to the kidneys, and must be used with caution when there is acute renal inflammation. Saccharin will prevent fermentation in urine, and when administered by the mouth will make it strongly acid. Both of these properties make it, theoretically, of probable utility; moreover, it can be given in large doses without harm. A few clinicians have reported favorable results from its employment in pyelitis. I have not tried it in acute cases; in chronic cases it will render the urine acid. Its antiseptic power is easily demonstrable in the laboratory, but not so easily at the bedside.

CHRONIC PYELITIS usually follows acute attacks, and arises from the same causes, but it may result from obstructions of the ureters or urethra. The latter may be due to stone or other foreign body in the ureter, or to compression by tumors, cicatricial tissue, or thickening of the walls of the urinary channels. Inflammation may extend from areas of chronic inflammation in the bladder, urethra, or renal parenchyma. Chronic pyelitis is liable to acute exacerbations. These must be guarded against by warm clothing, and, if possible, a life in an equable climate. The ingestion of renal irritants, or their absorption from the intestinal tract, must be guarded against. Excess of physical exertion should be avoided, especially if pyelitis is due to calculus. It goes without saying, that whenever possible the cause of the malady must be removed. This can sometimes be accomplished by surgical procedures, very rarely by medical ones.

As in acute cases, food must be bland. During periods of acute

exacerbation it should be liquid only; at other times it may be varied. It may be like that eaten in health, but articles which contain oxalates and other renal irritants must be avoided. Care should be exercised to limit gastric and intestinal fermentation, and regular, copious bowel-movements should be maintained. The creation and absorption of renal irritants can thus be lessened. Water should be taken copiously to make the urine bland, to flush the kidney and to help keep the pelvis clean. Two quarts of pure water ought to be taken daily. What has already been said of the use of water in lithiasis is applicable to cases of pyelitis calculosa. If chronic pyelitis is characterized, as it so often is, by slight suppuration, sulphur-waters can be used advantageously, as they lessen and prevent suppuration.

Balsamic preparations are employed in these cases, chiefly to prevent or to lessen suppuration because of their antiseptic properties. They are applicable when the parenchyma of the kidney is not involved, for they tend to congest, and in large doses to inflame it. Benzoic acid and the benzoates are among the best of these. Benzoic acid is soothing to inflamed mucous membranes. It makes the urine acid, and is mildly antiseptic. It can be given as benzoic acid or as a benzoate of sodium or lithium or as an emulsion of gum benzoin. The oil of sandalwood is well tolerated by many individuals; and it, too, lessens suppuration in the urinary channels. Copaiba and cubebs are too apt to disturb the stomach, if used in efficient doses, to be very useful in chronic pyelitis. Often infusion of buchu is prescribed. Nuclein has been much experimented with during the last two years, because of its possible power of combating deep-seated suppuration by its antiseptic property and ability to provoke leucocytosis. There are few reports in our current literature of its trial in pyelitis. I have employed it in several cases without positive results. One of these cases was due to cystitis which was provoked by retention of urine because of paralysis. At the time the patient came under treatment the pelvis of the right kidney was greatly distended with pus. Prompt and very great improvement was effected, indeed almost a cure, by the use of nuclein and by frequently emptying the bladder through a catheter. This latter procedure drained the distended kidney. At the same time the cystitis was treated by washing the bladder with mild antiseptics. I have seen just as good results obtained from the latter procedures only, and do not feel that the good effect observed can with certainty be ascribed to nuclein. I had at the same time another patient under treatment whose pyelitis was due to renal tuberculosis: although nuclein was employed most patiently I could detect no good results. In the mildest cases in which I have employed it positive results have also been wanting.

Astringents are used to lessen the formation of inflammatory

exudates, both mucus and pus. In mild cases, especially those characterized by mucous rather than by purulent exudates they are sometimes useful. Many times they are employed in alternation with balsamic preparations. One is used for a week or two, and then the other.

In both acute and chronic cases complicated by hæmorrhage, the treatment described above for hæmaturia must be used.

Kelly of Johns Hopkins Hospital has succeeded in not only removing from the pelvis of a kidney considerable amounts of sand and small gravel by catheterizing the ureter, but has succeeded in cleansing it with antiseptic washes. Such treatment has in his hands proved as efficacious as washing the bladder does in cystitis. Unfortunately it is a difficult procedure. It, however, creates hope of success in many cases that would be hopeless with other medical treatment.

In all acute cases and acute exacerbations in the course of chronic ones, rest in bed should be enjoined. In mild chronic cases gentle exercise may be permitted and is even useful, for it helps to maintain better general health, but great or prolonged exertion should be avoided.

If suppuration is considerable and successful drainage cannot be maintained through the ureter, a surgical operation is necessary in order to establish it.

(See also the latter part of Dr. Belfield's article.)

THERAPEUTICS OF THE GENITO-URINARY DISEASES OF WOMEN.

By EDWARD E. MONTGOMERY, M. D.

INFLAMMATORY DISEASES.

A PROPER recognition of the creative influence of bacteria in the production of the various forms of inflammation has necessarily led to many modifications of our plans of treatment for diseases of the genito-urinary tract in women. Its acceptance cannot but impress the physician with the importance of the most conscientious practice of cleanliness, not only in operative procedures, but in the ordinary manipulations for examination and local treatment. When we review the early record of this branch of practice it becomes a serious query, from which the patient has endured the greater risk—her disease, or the efforts pursued for its relief.

In the study of inflammation of this tract, the interdependence of the various local forms should not be forgotten. Thus, it is difficult to conceive of a severe inflammation of the vagina without an involvement of the vulva and cervix. The rapid extension of inflammation through the entire tract, lined as it is by a continuous membrane, justifies us in the consideration of the "inflammatory diseases" of these structures as a group. The frequently rapid progress of serious inflammation, the early production of pathological changes which impair or destroy the function of the reproductive organs, and the peril to the future comfort or even life of the individual, require such an arrangement of the subject.

The predisposition to the development of local inflammation is largely due to improper hygiene. Improperly constructed, insufficient and injudicious clothing, poorly regulated diet, want of care and cleanliness, neglect of exercise, are all important factors.

While we may not always be able to establish the original site of an inflammatory process, for purposes of study and description, it is more convenient to take up its consideration in a progressive course from without inward.

INFLAMMATIONS OF THE GENITAL TRACT.

Vulvitis.—Inflammations of the vulva present diverse appearances according to the structures involved and the cause of production.

Attempts have been made to indicate these differences by designating them as various forms of vulvitis, but when we recognize that in each case it is inflammation, the division into diffuse and circumscribed would seem preferable. The latter term may be applied to what is sometimes known as follicular vulvitis.

Inflammation of the vulva may arise from want of cleanliness, from decomposing lochia or menstrual discharge, from diabetic or decomposed urine, or constant bathing of the parts with urine, as in a vesical fistula or from incontinence, from uterine or vaginal discharge, gonorrhœal infection, puerperal sepsis, and in young children, from seat-worms.

The TREATMENT will depend upon the cause and extent of involvement. A slight inflammation of the vulva may arise from want of cleanliness, and the consequent retention of decomposing secretions. The skin between the folds of the labia majora and minora is richly provided with sebaceous glands. The decomposing sebaceous matter mixed with the vaginal secretion produces an exceedingly unwholesome and offensive odor, the tissues become irritated, scaled, and abraded. Pruritus is intense. Frequently, careful washing with soap and hot water, and the separation of the parts by pledgets of cotton, oakum, or lint, leads to speedy relief.

The treatment of the gonorrhœal form will be discussed with the subject of Vaginitis.

The first step in the treatment of any form of vulvar inflammation must be the determination and removal of its cause. The urine should be carefully examined. The association of vulvitis with diabetes may be suspected when the inflammation extends over the labia, perineum, and adjacent surfaces of the thighs, particularly if the parts present numerous whitish points or tufts, the algæ, or yeast-fungus. The pruritus is intolerable.

The diffuse variety is not infrequently complicated by inflammation of the orifice of the urethra, the ducts and glandular structure of Bartholin's glands, the loose cellular tissue, and the inguinal lymphatic glands.

In the acute forms the patient should be kept quiet, the parts frequently washed or douched with an antiseptic fluid—corrosive sublimate (1 : 5000), carbolic acid (1 : 50).

In the early stages the application of cold, the ice-bag, or cold lotions will frequently ameliorate its gravity. The ice-bag should not be continued sufficiently long to endanger necrosis. In the later stages, hot antiseptic solutions will be more efficacious: lint or gauze saturated with the solutions of sublimate and carbolic acid already named, or borax 1 : 100, covered with rubber dam or wax-paper, and kept in place by a T-bandage. Where there is much secretion the parts should

be frequently washed with hydrozone, dried with absorbent cotton or gauze dusted with iodoform and tannin (4 : 1), aristol and desiccated alum (8 : 1), or the stearate of zinc. The application of the powder, in addition to its inhibitory action upon germ-production, keeps the inflamed surfaces apart. The separation of the surfaces is very important and may be more effectually accomplished by the use of pledgets of lint, absorbent cotton, sterilized gauze or prepared oakum. The pledget may be utilized for the more continuous action of a drug by the application of diachylon ointment, ichthyol in lanolin (1 : 12), or ammoniated mercury ointment (15 grains to the ounce).

Suppuration of the vulvo-vaginal glands should indicate early incision. The opening, after irrigation, should be packed with iodoform gauze. If the gland has not broken down it is best removed, as its retention after obliteration of its duct will lead to the formation of a cyst. Abscess of the loose cellular tissue should be promptly evacuated and drained. The vulvitis produced by diabetic urine is promptly relieved by washing with a solution of sodium hyposulphite ($\frac{1}{2}$ ounce to the pint), and keeping the surfaces apart by pledgets medicated with diachylon ointment.

The *circumscribed* or *follicular vulvitis* is frequently exceedingly obstinate; the separate hair-follicles seem to become involved without inflammation of the intervening skin. In obstinate cases it is better to shave the genitalia, puncture and cauterize with stick silver nitrate each affected follicle, and keep the parts covered with ammoniate-of-mercury ointment.

Infants and young girls not infrequently develop vulvitis from want of cleanliness. Occasional epidemics of the disease are seen in schools and infirmaries, due to infection. The development of such a condition should be considered an indication for prompt treatment, as extension of inflammation to the deeper structures is not infrequent before puberty and affects their development and the subsequent performance of their functions.

The retention of sebaceous secretion beneath the prepuce of the clitoris is capable of setting up an adhesive inflammation which fixes the prepuce over the entire glans. When it has been long continued, the glans and clitoris are poorly developed, the retained smegma often produces itching, irritation of the bladder, nervous phenomena, occasionally convulsions, and not infrequently leads to the practice of masturbation. The prepuce should be stripped back, all particles of secretion removed, and the parts subsequently be kept clean. Where the prepuce is so long as to completely envelop the glans like a hood, the reproduction of the condition may be obviated by removing with scissors a piece of skin about one-half inch above the glans and introducing sutures. This procedure exposes the glans.

Pruritus is a very common symptom of vulvar inflammation, and is relieved by treatment adapted to the causal condition, but we sometimes find severe pruritus unaccompanied by signs of inflammation. Its existence should always lead to careful examination for a local cause. The diet should be carefully regulated and the general health improved.

Efficient local applications are a 2 to 5 per cent. solution of carbolic acid, chloral ($\frac{1}{2}$ drachm to the ounce), diachylon ointment, or ointment containing 5 per cent. carbolic acid, and 10 grains cocaine to the ounce. In very obstinate cases, painting with a stronger solution of carbolic acid, nitrate of silver (30 grains to the ounce), or tincture of iron chloride may be required. Where the itching is confined to small spots they may be removed. Fehling gave permanent relief in an obstinate case by removing both labia majora and the clitoris. Smyly advises equal parts of powdered alum and sugar, dusted over the parts.

Vaginitis.—Inflammations of the vagina may be considered as acute and chronic, simple and specific, or gonorrhœal. The character of the inflammation is somewhat dependent upon the age of the patient.

The normal discharge from the vagina, according to Döderlein, is a whitish exudation of the consistence of clotted milk, of an intensely acid reaction, containing an almost pure culture of the vaginal bacillus. Other micro-organisms, as the oïdium albicans and the yeast-fungus, are rarely detected. So long as the vaginal discharge remains normal, the mucous surface is particularly resistant to the encroachment of disease.

It is generally contended that the vagina is rarely the original site, but becomes involved by extension of inflammation from either the cervix or vulva. The normal vaginal discharge is necessarily modified by the alkaline discharge from the cervix during menstruation, the puerperium, endometritis, and cancer. Sexual intercourse may convey saprophytes, tubercle bacilli, gonococci, and other germs.

The mucous surfaces of the vagina are rendered more vulnerable to the encroachment of disease by the causes given, by sloughing myoma and septic puerperal affections; by contact with irritating alkaline urine and fæces in vesico-vaginal and recto-vaginal fistulæ, by retention of badly fitting and foul-smelling pessaries, by the use of too hot vaginal douches, too long retention of tampons, the introduction of an infected syringe-nozzle, or careless examination with dirty hands and instruments.

Certain constitutional conditions favor the production of leucorrhœa, as tuberculosis and anæmia. Vaginitis may be caused by the exanthemata, diphtheria, erysipelas, and dysentery.

In the TREATMENT, where possible, the first consideration must be the removal of the cause.

In the acute form, the vagina may be irrigated with either hot or cold mild antiseptic douches. When severe, and especially in the gonorrhœal form, it will be complicated by inflammation of the vulva. Hot antiseptic fomentations and hot sitz-baths will be found grateful. The patient should rest in bed. The importance of early arrest of the disease should lead to active treatment. Alternate douches of hydrogen peroxide and hot water should be used every few hours. One or two ounces of the former may be thrown into the vagina to be washed away in a few minutes with a hot-water douche.

When the acute symptoms sufficiently subside to permit the introduction of a speculum, the vagina should be carefully cleansed with hydrogen peroxide and its inflamed surfaces kept separate by a light packing with iodoform or aristol gauze. The gauze should be removed the following day. The packing may be preceded by the use of a solution of silver nitrate ($\frac{1}{2}$ drachm to the ounce), this application to be made every second to fourth day. The gauze should be removed at the end of twenty-four hours and a douche of a weak solution of lead and opium or solution of ammonium chloride (2 drachms to the pint) used two or three times daily (Collyer). G. D'Aulnoy, in gonorrhœal vaginitis, after cleansing the vagina soaks two or three tampons in a mixture of—Pyoktanin 10 parts, alcohol 15 parts, potash $\frac{1}{5}$ part, water 200 parts. This is placed in the posterior vaginal cul-de-sac and the vulva occluded by a dry pad. This dressing is left in place two days. The pain is greatly lessened. Glycerin tampons are subsequently substituted, which are changed daily. Generally the blue stain disappears upon the fourth day and secretion from this time is absent.

In the chronic forms, cleansing, frequent douching, and the use of astringents must be our dependence. Applications of silver nitrate solution (from 10 grains to 1 drachm to the ounce) may be made by swabbing through a speculum, or in obstinate cases a weaker solution may be used with an atomizer. Insufflation of powders serves to medicate and keep the surfaces separated, as : Iodoform 3 parts, tannic acid 1 part ; or, Aristol 4 parts, desiccated alum 1 part. Alum and sugar equal parts are useful. Coition should be discontinued until the disease is cured.

An inflammation of the vagina characterized by absence of rugæ and the presence of a roughened granular surface is seen following the climacteric in those suffering from a rheumatic diathesis or addicted to the use of alcoholic agents.

Constitutional treatment or the correction of the habits of living is generally efficient in affording relief.

Vulvo-vaginitis in young girls presents difficulties in its treatment, yet it is very important that it should be carefully combated. Such cases not infrequently reach puberty with chronic inflammation of the endometrium. The introduction of crayons is extremely painful. Rocaz uses through a soft-rubber catheter a vaginal irrigation of potass. permanganate 1 : 4000, increased in strength to 1 : 1000. At first a slight increase of discharge is noted which soon subsides.

In such cases Richard Pott would first remove every vestige of the hymen and then use small bougies of iodoform 5 to 8 cm. in length.

Vaginismus is so frequently associated with fissures about the posterior commissure of the vulva and is so painful as to fully entitle it to consideration under the division of inflammation. Its presence should indicate a careful examination for fissures of the vaginal and anal orifices. Occasionally points of hyperæsthesia will be found upon the sides of the vagina, to which the touch of a small brush causes agony. Such points should be removed with the knife or scissors. Muscular spasm due to the presence of fissures of vagina or anus may be overcome by giving an anæsthetic and stretching, and subsequently wearing for an hour or two daily a glass vaginal plug.

Vaginal suppositories of opium, belladonna, or iodoform may be found useful. The vulva and vaginal introitus may be painted with a 5 per cent. solution of cocaine before coitus.

Lutaud advises irrigation with potass. chlorat. et tr. opii, *āā.* 200 parts; aquæ picis, 200 parts—a tablespoonful to a quart of water—to be followed at night by the following bougie:

℞.	Cocainæ hydrochlorat.,	gr. iv (0.2);
	Ext. belladonnæ,	gr. ij (0.1);
	Strontii bromidi,	gr. iv (0.2);
	Olei theobromæ,	ʒij (8.0).—M.

Inflammation of the Uterus.

Probably no organ of the body affords greater difficulty in determining the presence of inflammation and its classification, than is experienced in the study of diseases of the uterus. Hæmorrhage and leucorrhœa, symptoms of inflammation, are not infrequently consequent to various constitutional conditions.

Leucorrhœa is frequent in constitutional conditions, as tuberculosis, syphilis, rheumatism, gout, anæmia, and chlorosis. It is quite as likely to occur as nasal or pharyngeal catarrh. Uterine hæmorrhage is a frequent symptom in the exanthemata, in malaria, in lesions of the heart, liver, and kidneys, in irritation or inflammation in the

neighboring organs, as the tubes, ovaries, peritoneum, bladder, and rectum.

It is very difficult to present a classification which will satisfactorily cover symptoms and pathological changes. Pozzi's seems most acceptable, which is *acute* and *chronic* metritis—the latter divided into hæmorrhagic, catarrhal, and chronic painful.

Divisions are frequently made into cervical and corporeal inflammations, but as it is exceedingly rare to find the one without the other it seems an unnecessary arrangement.

Causes of inflammation may be divided into constitutional and local; the former by influencing the uterine circulation render the organ more assailable. The conditions which have already been named as producing leucorrhœa and hæmorrhage may justly be classed as constitutional causes of inflammation. Habits of living, mental impressions secured through erotic reading or conversation, frequent sexual excitement, inordinate sexual intercourse, and masturbation are additional causes. The most frequent cause is septic infection following abortion or parturition, either from the introduction of sepsis or the retention of decidua, clots, or portions of placenta.

Sepsis may occur in the non-puerperal from want of care in manual and instrumental procedures. Next to sepsis in its baneful influence must be placed gonorrhœa. A local cause of inflammation which may be classed among the predisposing is uterine displacement.

Treatment.—Pozzi justly urges the advantage of *prophylaxis* in the treatment of uterine inflammations, and urges that when there is reason to fear that portions of membrane or placenta have been left in the uterine cavity no time should be lost in their complete removal: we should not await hæmorrhage, for the mucous membrane may then be already infected. He advises the dull Récamier curette and weak sublimate injections.

The treatment may be divided into constitutional and local. The former may be to some extent proper to all forms of inflammation. Violent exercise, over-fatigue, and the sexual relation must be avoided. The healthy action of the alimentary canal must be promoted. Constipation should be overcome so far as possible by the use of food (Graham bread, vegetables, prunes, and figs), mild laxatives (mineral water), and enemata, to which glycerin should be added. An enema of a tablespoonful of pure glycerin, or a glycerin suppository, will frequently be sufficient. The daily evacuation of the bowels should be a matter of habit. This can be promoted by eating a dozen each of almonds and raisins at night and taking a glass of water before breakfast, the use of a teaspoonful of bran in water before breakfast, or with some patients a teaspoonful of white mustard in water before meals.

The long-continued use of drastic purgatives should be avoided, but it is so important to unload the lower bowel that resort to them must at times be made. The following prescription accomplishes the purpose, while at the same time it helps to overcome the disposition to constipation :

℞. Aloin., gr. iv (0.2);
Ext. cascar. sagrad., gr. viij (0.6);
Ext. belladonn.,
Ext. nuc. vom., āā. gr. iij (0.15).
M. et ft. capsul. No. viij.
S. One capsule at night as needed.

The general condition of the patient must be promoted by suitable tonics. Any special diathesis, as the rheumatic, should be combated.

The mineral waters are of value; in anæmic patients the ferruginous, sulphur, or arsenical should be advised. Springs charged with chloride of sodium are of special advantage in scrofulous and lymphatic patients, but are of still greater advantage in all visceral engorgements.

Acute Metritis.—Rest in bed must absolutely be demanded, a light, readily digested diet given, and saline laxatives administered. An ice-bag or hot fomentations, according to which affords the most comfort, should be applied over the abdomen. Hot vaginal douches (110° to 120° F.) of large quantities of water are of service. Bloodletting may be employed with advantage. The cervix is exposed by a speculum, cleansed, and a number of punctures made with a spear-shaped scarificator, a bistoury, or a needle. The bloodletting may be followed by a pad of iodoform gauze or with a tampon saturated with glycerin.

The glycerin has an affinity for the watery portions of the blood and exercises a hydragogue effect by unloading the engorged vessels. Barbour prefers a 10 per cent. solution of ichthyol in glycerin. If the tenderness is so marked that the tampon is not well borne, he uses an ichthyol suppository. Exfoliative metritis, known as membranous dysmenorrhœa, should be regarded as indicating the use of the curette. If it is associated with contraction of the cervix, the curette should be preceded by dilatation and followed by painting the cavity with a strong solution of iodine. For acute gonorrhœal metritis Pozzi uses the curette, followed by intra-uterine cauterization with strong chloride of zinc by means of cotton rolled on probes. Gonorrhœal arthritis has been known to follow such treatment.

Catarrhal Metritis.—Chloro-anæmia is an early symptom, so constitutional measures must be employed to supplement local treat-

ment. Thorough antisepsis of the vagina is important. The measures employed to secure it will have a beneficial influence upon the uterus, and especially the cervix, which is generally the part most affected. Douches, sublimate (1:3000), carbolic acid (1:50), at a temperature of 115° F., may be frequently repeated. The former should not be continued for too long a time for fear of poisoning. In severe cases, the treatment to be effective must attack the cavity of the uterus, and may be by antisepsis, cauterization, or curettement, or a combination of all. The uterine cavity may be irrigated with a weak antiseptic solution through a double catheter. If the instrument is not readily introduced, it may be preceded by a laminaria tent or the use of an Ellinger dilator.

Any severe application to the uterine cavity should be preceded by extensive dilatation of the cervical canal, preferably with dilators. A set of Pratt's sounds with a central handle and a bougie on either end are very efficient. The direction of the canal should be known and care exercised to avoid puncture. Dilatation should be followed by curettement with a sharp curette the handle of which is hollow to permit of irrigation to wash away the débris as the curettement is done. This procedure may be followed by swabbing or injecting with tincture of iodine, a solution of the perchloride of iron, a strong solution of zinc chloride, silver nitrate, creasote, or carbolic acid. After application of any of these remedies the superfluous fluid should be removed by irrigation and the cavity lightly packed with iodoform gauze. The gauze as a tampon decreases hæmorrhage, favors closing up the vessels by plastic exudate, increases the activity of the circulation, by its presence as a foreign body promotes uterine contraction, and through its capillary action serves as a drain. It should be removed at the end of three days, and may be renewed after irrigation of the uterine cavity, or the patient may subsequently be treated by vaginal irrigation.

This treatment should be followed by no elevation of temperature; should it occur the gauze should be removed and intra-uterine irrigation at once given. If the external os is small, a crucial incision should be made prior to the dilatation, otherwise it will contract and again interfere with free drainage, which it is exceedingly important should be maintained.

Snegiroff advocates the use of steam, at a temperature of 100° C., in the treatment of endometritis. It produces cicatricial cauterization in the mucous membrane and when prolonged gives rise to a burn. In chronic catarrhal endometritis, he says, this procedure should be applied energetically. The apparatus consists of a receiver warmed with an alcohol lamp, provided with a thermometer. Steam passes from the receiver through a rubber tube into which is fastened a

metallic tube through which the steam enters the uterine cavity. The membrane that surrounds the external os becomes white very rapidly. Afterward about a teaspoonful of brownish fluid similar in appearance to meat-juice exudes from the neck of the uterus, and the vagina is dressed with iodoform.

Chase of Brooklyn, as a local application uses iodoform, glycerin, and iodine in equal quantities. He says that probably one of the best agents is a few drops of iodine and glycerin in equal quantities: iodine is antiseptic, stimulating, alterative, and promotes absorption. Another valuable remedy is aristol dissolved in 10 per cent. solution of albolene. He asserts the danger in the use of instruments is not so much from traumatism as from sepsis. Sponge tents should never be used, as they involve a great risk of injury to the cervical tissues and to septic infection. Any abrasion of the cervical tissue should be touched with pure carbolic acid.

The treatment of hæmorrhagic metritis may be divided into palliative, for relief of the bleeding, and curative. The patient should be kept absolutely at rest, prolonged vaginal injections of hot water given; ergot is of but little advantage; it may be given with more advantage in combination with hamamelis and cinnamon as follows:

℞. Ext. ergot fl., f℥j (30.0);
Ext. hamamelis fl.,
Tr. cinnamoni, āā. f℥ss (15.0).—M.
S. A teaspoonful may be taken every two or three hours.

Fluid extract of hydrastis is sometimes efficient in 20-drop to drachm doses. Falk recommended, and Czempin has given, hydrastin, the active principle of hydrastis, in $\frac{1}{4}$-grain doses every six hours with marked benefit. Dilatation of the cervix or the use of a laminaria tent will stop the bleeding temporarily; more effective would be packing the cervical canal with iodoform gauze. The latter is more effective than vaginal tampons, and the gauze packing exercises a direct influence upon the diseased mucous membrane. In persistent and obstinate bleeding, the uterine arteries may be ligated by passing a ligature through the lateral vaginal fornices without incision, or better, with an incision, passing the ligature so as to secure the uterine arteries. The best hæmostatic, at the same time curative in character, is the use of the curette. It should be used as soon as possible, followed by injection of perchloride of iron, and the cavity irrigated. In rare cases we have hæmorrhage of so persistent a character that it is necessary to resort to either the removal of the ovaries and thus the establishment of the artificial menopause, or do a vaginal hysterectomy to remove the source from which the bleeding occurs.

In chronic painful metritis the use of local bleeding, scarification, and puncture is followed by a coat of tincture of iodine and a glycerin tampon. Tampons may remain four or five days if a little iodoform has been added. Hot douches are of value, particularly where complicated by perimetritis. Massage is a very efficient agent in treatment of such cases, particularly when the uterus is fixed by perimetritic adhesions. In cases in which the cervix is very painful, causing distress in sitting and walking, much relief can be afforded by amputation of the cervix. The removal of a portion of tissue, the rest in bed, the alterative changes which take place, will result in decrease in the size of the uterus and the unpleasant symptoms are not infrequently entirely removed. This amputation should be done with a knife or scissors and the parts accurately brought into apposition so that the least amount of cicatricial tissue will result. Where the inflammation is complicated by extensive laceration of the cervix, with eversion of the lips, and a plastic exudate fills up the fissures, the best method of procedure will be to either amputate the cervix or remove the indurated tissue, freshen the edges of the fissure, and unite the surfaces by sutures. In performing this operation it is exceedingly important to so accomplish it that a good broad surface is left for the future os, otherwise contraction of the cervical canal takes place, defective drainage, and the development of diseased conditions extending into the tubes, ovaries, and peritoneal cavity, necessitating a serious and sacrificial operation.

Inflammation of the uterus in some form is common to all ages. It is frequently seen in girls of the ages of twelve to sixteen, when it produces menorrhagia, erosion of the external os, erosion and eversion of the lips, resembling a laceration of the cervix. Adenoid vegetations are found in the cervical canal (Mundé). The hypertrophic mucous membrane should be excised, the endometrium curetted, and if eversion is marked, the edges of the lips pared and sutured.

Senile Endometritis.—In the aged a muco-purulent discharge often follows the climacteric, which causes erosion of the lips of the cervix and the vault of the vagina. This condition may follow operations to artificially establish the menopause. It is usually readily cured by the use of a solution of silver nitrate ($\frac{1}{2}$ to 1 drachm to the ounce). The use of the curette followed by the solution just named or one of chloride of zinc is advisable.

Inflammation of the Uterine Appendages and of the Peritoneum.

The existence of inflammation in a Fallopian tube does not necessarily indicate the presence of coexisting trouble in the corresponding ovary, surrounding peritoneum, or the reverse, but they are

so frequently associated that it seems more convenient to consider them together. Inflammation extends from the uterus to the pelvic structures in one of three ways: first and most frequently, by the continuous surface lining uterus and tubes; second, through the blood-vessels; third, by the lymphatics. The extent of involvement, and the destructive influence of the disease are dependent upon the activity of the infecting poison and the degree of resistance of the tissues of the infected individual. Infection and disease of the pelvic structures may occur without infection from the uterus being responsible, as through the intestinal canal, and more rarely the urinary tract may present the avenue by which it finds entrance. Disease of the right tube and ovary are not rare occurrences from infection by a diseased vermiform appendix.

TREATMENT necessarily depends upon the character and extent of involvement. Our constant aim should be the preservation of life and restoration to health with the least possible sacrifice of organs and disturbance of their functions. To accomplish this we must be on the alert and ready to attack the encroachments of disease promptly and boldly.

Acute inflammations of the pelvis should be combated by rest, saline laxatives, hot vaginal and rectal douches, the continuous use of the ice-bag over the abdomen, early uterine curettement and gauze-packing, prompt incision and drainage of the broad ligament or retro-uterine cul-de-sac (Henrotin), breaking up exudate or adhesions, packing with gauze in order to afford pelvic drainage. The uterine gauze may be removed in forty-eight to seventy-two hours; that from the pelvis in ten days (Pryor).

The early application of this treatment may anticipate and avoid suppuration. The resulting adhesions and fixation may subsequently be overcome by the judicious exercise of pelvic massage and the use of glycerin tampons. Non-suppurative inflammation with fixation of the pelvic organs may be similarly treated, or by breaking up adhesions by means of a free incision through the posterior vaginal fornix.

Retro-uterine adhesions and those binding down the ovaries and tubes may thus be separated. Such a procedure is far more rational than that suggested by Schultze to drag the rectum from the posterior surface of the uterus by introducing two fingers into the former organ, or that of Sims to drag away the uterus by the introduction into its canal of a bougie. Neither procedure affords an opportunity to discover the extent of, nor the means to combat, a resulting injury.

Extension of inflammation into the tube produces a salpingitis, perisalpingitis, a sealing up of its abdominal end, a collection of serum and a resulting hydrosalpinx; the formation of pus, a pyosalpinx,

or extravasation of blood, or even hæmorrhage, a hæmatosalpinx, according to the virulence of the poison and resistance or want of resistance in the infected individual. The ovaries may be infected by direct passage of septic germs into an ovary rendered vulnerable by a recent rupture of its Graafian follicle or the pressure of a corpus luteum, or an infected tube, becoming adherent to a cystic ovary; subsequently through pressure-absorption a communication may be caused between them and thus cause a tubo-ovarian abscess. Tubal or tubo-ovarian cysts may be comparatively free from adhesions or be firmly fixed. Purulent collections are generally associated with extensive pelvic inflammation. Large collections generally result in rupture of the tube and the formation of an abscess in the broad ligament, or the pus may be encysted in the retro-uterine space.

It should be well understood that not every case of pelvic inflammation demands operative procedure. In rest, saline purgatives, hot douches, glycerin tampons, counter-irritants, and pelvic massage we have measures capable of restoring many such patients.

The existence of the severer forms of pelvic trouble does not absolutely demand sacrificial operations. As has already been suggested, early resort to vaginal incision and drainage may prevent suppuration, and abort a threatened severe and destructive inflammation.

With the advent of suppuration, Nature endeavors to bar the way to infection of the general peritoneal cavity by plastic exudate, which glues together the viscera. To operate upon a large pus-collection by abdominal incision means that the guards which Nature has so laboriously provided shall be effaced, that the general peritoneum shall be soiled by the removal through it of the pelvic pus. It would seem the wiser course to secure evacuation through the vagina. In some cases this will be found comparatively easy, as the collection, where it is encysted in the posterior cul-de-sac, may impinge upon the vagina, or it has filled up the broad ligament. In other cases it may require considerable dissection between the folds of the broad ligament, pushing to one side ureter and uterine artery. In all drainage operations it is important that no mere tapping of the collection, but a free incision shall be made. Conservation of function and structure has been announced as the guiding principle of the modern surgeon in the treatment of pelvic inflammation. But in cases in which the destructive influences have rendered the retention of the ovaries and tubes inconsistent with restoration to health, the question arises, What shall be done with the uterus?—the organ in which the infection developed and from which it extended—an organ whose functions are secondary to those of the ovaries, and in which changes are produced by the pathological process which will render it a source

of numerous local and reflex phenomena following the artificial menopause induced by the removal of the appendages.

Removal of the Uterus.

The recognition of these secondary manifestations led Baldy to advocate the supravaginal removal of the uterus in abdominal section wherever the destructive process required the removal of both ovaries. The relief of some neurotic phenomena by removal of uteri *per vaginam*, in cases in which the appendages had been previously removed through the abdomen, induced Péan to advocate what he calls uterine castration wherever both ovaries and tubes are irreparably diseased.

Both parties appreciated the baneful influence produced by retention of a subsequently useless organ which had been the original source of infection, but the course of procedure was very opposite. For the *abdominal* operation it is claimed, first, that the field of disease is more accessible; second, that a more complete operation can be accomplished because sight and touch can both be exercised; third, that it enables the operator to retain the cervix to help round out the vagina; fourth, that the peritoneal cavity can be closed, decreasing the possibility of hæmorrhage and infection; fifth, that the danger of injury to the ureter, bladder, or intestine is less, and when produced is more readily repaired. The advocates of the *vaginal* procedure, claim, first, that it permits of exploration and evacuation of pus-cavities before the peritoneal cavity is opened, thus decreasing the danger of peritoneal infection; second, that uterus, ovaries, and tubes can be easily removed, and with less disturbance of intestinal adhesions; third, that drainage is with and not against gravity, and from the most dependent part of the abdominal cavity; fourth, that with careful procedure no necessity exists for more danger of injury to bladder, ureter, or intestine than in the abdominal procedure; fifth, there is no danger of such unpleasant sequelæ as abdominal fistulæ and ventral herniæ; sixth, convalescence is more rapid.

It cannot be denied that both procedures have a place: while the vaginal route decreases the frequent necessity for the abdominal procedure, it should not always supplant it. The indications for each procedure in inflammatory diseases may be briefly stated as follows: The abdominal operation should be preferred, first, in unilateral disease of the appendages where the mass is comparatively free and does not encroach upon the lateral or posterior vaginal fornix; second, in bilateral disease of long standing where uterus and appendages are firmly fixed, without any indication of large pus-collection. The vaginal may be judiciously elected, first, where either large unilateral or bilateral collections of pus evidently impinge upon the vaginal

walls, whether they be situated posteriorly or laterally; second, where bilateral disease so profound in character exists as to demand the removal of both ovaries and tubes. In weak, debilitated patients suffering from large collections of pus, the choice of the vaginal route does not necessitate the performance of a radical operation. The condition of the patient may demand a palliative operation. The heavy load of infection is evacuated by a simple operation and with but slight danger to the patient. After the patient has had a chance to recuperate her weakened vital forces a radical operation may be done, through the vagina or by abdominal section as may seem best adapted to the individual case.

The removal of the uterus through an abdominal incision may be complete or partial. The latter is more frequently practised. The procedure is performed as follows: After the ordinary preparation an incision three or four inches long in the median line is made, the ovaries and tubes separated and brought out, using an aspirator to remove pus-collections, and carefully guarding the viscera and wound-surfaces with gauze packing to prevent soiling from rupture of an abscess. A ligature is introduced through the broad ligament and tied external to the tube and ovary. The ligament is cut between the ligature and a pair of forceps placed next to the uterus. The opposite ligament is treated in a similar manner. If properly introduced, these ligatures have controlled the ovarian arteries. A peritoneal flap is now turned down from the anterior uterine surface, and with it the bladder. One end of the ligature is carried through the base of the ligament, and when tied secures the uterine artery, first upon one side and then upon the other. The cervix can now be cut through, removing the major part of the uterus without fear of hæmorrhage. Should any bleeding occur, the ligatures may be again introduced to secure an additional section of the broad ligament. The use of a continuous ligature gathers the ligament up, and renders the entire surface more easily covered with peritoneum (Goffe).

In amputating the uterus, care has been exercised to leave a short flap upon the posterior surface. By a continuous suture of fine silk or catgut the peritoneal flaps are covered over the stump, rendering the operation a retro-peritoneal one. Having determined that hæmorrhage is controlled and the pelvis clean, the wound in the abdomen is closed.

HYSTERECTOMY complete is performed in a similar manner, excepting that instead of cutting through the cervix an incision is made into the vagina posteriorly and the cervix closely hugged with scissors until the entire organ is removed; any branches of the vaginal artery or unsecured portion of the uterine artery may be ligated separately or in mass. The peritoneum may be closed as before, previously

taking the precaution to pack lightly the raw surface below it with iodoform gauze.

Vaginal Hysterectomy.—In the removal of the uterus by the vaginal route we may employ either the ligature or the clamp. The convalescence and subsequent progress of the case will be more satisfactory with the latter. It is exceedingly difficult to prevent ligatures from becoming infected, and when infection occurs the patient will have a discharge until the ligatures come away. The use of the clamp greatly expedites the operation. The instruments required are four wide and one narrow-bladed retractors, three double tenacula, a knife, scissors, six clamp forceps, a dozen hæmostatic forceps, and a thermo-cautery. After exposure with the retractors the cervix is seized with a tenaculum, drawn down, and the vagina separated from the cervix by the thermo-cautery knife. The vagina and bladder are pushed off anteriorly and the vagina posteriorly until the peritoneum is reached. The latter can be more readily determined anteriorly by elevating the vagina and bladder by a retractor, while traction downward and backward is made upon the cervix. The peritoneum behind the uterus is opened and the surface explored, when adhesions may be carefully separated as high as the fundus, particularly if the organ is retro-displaced. When the organ is non-adherent the anterior peritoneum may be opened at once, and the uterus will then be retained only by the broad ligaments. The inferior portion of each ligament is secured by a pair of clamp forceps and cut between them and the cervix. The latter is amputated at the level of the upper end of the forceps; before the amputation is complete, the anterior margin of the remaining portion of the uterus is secured by a double tenaculum. Traction upon this rotates the uterus forward through the anterior opening, when the fundus can be seized and the organ be completely inverted. The amputation of the cervix permits this to be accomplished through a smaller arc. The presence of adhesions may have prevented the early entrance of the anterior cul-de-sac; the amputation of the cervix and dragging forward of the uterus permits this to be safely and expeditiously accomplished. Adhesions may be separated, under the sight, at the expense of the uterine structure when close and firm. The eversion of the fundus and separation of adhesions permit the exploration and separation of the left tube and ovary, after which a clamp forceps may be applied upon the upper part of the ligament, securing the ovarian artery; cutting the ligament between the forceps and uterus permits the latter to be held by the one side. The right ovary and tube are now brought down, the ligament secured with forceps, and the uterus removed. The separation of the ovary and tube occasionally may not be so readily accomplished. To afford additional room in such cases the upper part of the ligament may be

secured with smaller forceps, the uterus removed, and the ovary and tube then enucleated. As the appendage is drawn out a large forceps on either side is made to replace the smaller instruments. In rare cases the tubes and ovaries will be so firmly fixed as to preclude their removal, when they should be torn open and carefully packed. After completion of the removal, careful inspection should be made for hæmorrhage, the vagina and pelvis irrigated with hot salt solution, and the cavity packed. The gauze should be carried over the ends of the clamp forceps to prevent their injuring coils of intestine. The dressing is completed by covering the external ends of the forceps with gauze and cotton to prevent their being a means for entrance of pathogenic bacteria. This dressing should be changed as frequently as it becomes soiled.

The clamps are removed at the end of forty-eight hours, the gauze in four to six days. A few hours subsequent to the removal of the gauze a vaginal injection should be given, and repeated twice daily, or oftener, according to the amount and character of the discharge. The sloughing of the tissue included in the grasp of the clamps will produce some odor. The latter may be lessened or removed by douches of sulphurous acid (1 : 30), electrozone, a strong chlorinated water (1 : 4), or a 10 per cent. solution of the lactate of silver. The patient may be permitted to leave her bed at the end of ten days to two weeks.

Inflammation of the Ovaries.

Inflammation of the ovaries is called peri-oöphoritis when it affects the periphery, and oöphoritis when the structure of the organ is involved. It is also divided into acute and chronic. These conditions do not exist alone, but are a part of a more general disease.

Inflammation of the peritoneum called perimetritis involves, with the other pelvic organs, the surface of the ovary, causing adhesions slight in character, forming firm bands, or so extensive as to bury the ovary so that it can be discovered only by enucleation. The more acute forms of inflammation are associated with general sepsis. The ovary in pregnancy is particularly vulnerable. Its larger corpus luteum is easily infected. The writer has seen the ovary infected, resulting in an abscess, without any apparent involvement of the tube. That the tube was the avenue for infection was evident from the presence of a portion of lymph upon the side of the ovary, and another of similar character in the tubal ostium. The disease may undergo resolution or may result in chronic inflammation or the formation of an abscess.

The treatment consists in rest, depletion by saline purgatives, application of the ice-bag, or, where the latter is badly borne, hot applications. Continuous high temperature associated with pelvic symptoms should be regarded as an indication for removal of the diseased organ.

The chronic forms should be combated by judicious measures. The relief of pelvic congestion, the exercise of counter-irritation, and administration of alterative remedies may obviate the necessity for operative interference.

The existence of such conditions should not be regarded as demanding an abdominal section. When displaced, the ovary should be pushed up and supported by tampons or a suitable pessary. The patient should be cautioned against lying on her back. Where the organs as a result of disease are enlarged, painful and sensitive, and the general health is breaking down, an incision should be made. This need not be done through the abdomen, but by way of the vagina. The operation, known as "anterior colpotomy," has been largely practised by Martin of Berlin. An incision is made through the anterior fornix of the vagina, pushing off the bladder until the peritoneum is reached and opened. The ovaries are easily drawn through into the vagina, excised, resected, or punctured as their condition may demand.

Cystic ovary is a consequent of chronic inflammation; the resulting hardening of the tunica albuginea causes it to rupture before the matured follicle with difficulty or not at all. A number of such cysts may be found in an ovary, producing so much hyperæmia of the pelvis as to lead to intractable uterine hæmorrhage. The latter symptom may be so marked and persistent as to demand the removal of the ovaries.

Tubercular inflammation, occurring in either tube or ovary, should be regarded as an indication for prompt excision of the offending structures. Complicated by extensive pulmonary involvement or destruction, any operative procedure must be considered of doubtful expediency, if not absolutely contraindicated. A judicious *conservatism* in the surgery of the pelvis will lead the operator to preserve organs whole or in part wherever opportunity affords. Human nature is so constituted that we prize in the highest degree that which is lost. Many apparently seriously diseased organs may be saved or restored to functional usefulness. The separation of adhesions will set free a healthy but otherwise worthless tube. Gersuny recently opened the abdominal end of a Fallopian tube which contained a large quantity of fluid blood and fixed in it the adjacent ovary. The woman, who had been sterile through a five months' marriage, conceived in two months.

Pelvic Cellulitis and Peritonitis.

Pelvic Cellulitis.—The cellular tissue about the uterus, and in the broad ligaments, is particularly prone to inflammation as a result of sepsis. The infection may enter through the wounds of the peri-

neum, vagina, or walls of the uterus. The lymphatics are generally the conveyers, consequently there is lymphangitis, and without doubt inflammation, and not infrequently suppuration of the lymphatic glands.

In the treatment must be considered rest, the maintenance of nutrition, the use of tonics, application of cold or heat, early incision, and drainage where the involved structures are accessible.

Pelvic peritonitis is much more frequent, and may result from an extension of septic or gonorrhœal infection through the uterus and tube. Inflammation in the latter leads to occlusion of its abdominal end, when the peritonitis may be in the form of a perisalpingitis, or the inflammation may extend through the uterine walls. While the source of infection is generally uterine, it may result from infection through the intestine, from bruising of the rectum during labor, from the vermiform appendix, from the rupture of a tubal-gestation sac, and the escape of blood into the peritoneal cavity. Such a collection may become encysted.

The inflammation may be confined to the pelvis or become general. The suffering is more intense than in cellulitis, so that it may be necessary to ameliorate the distress by opium or morphine. The main dependence should be upon the frequent administration of salines until purgation is produced, thus depleting the congested peritoneum. The use of the ice-bag affords great relief. Early resort should be made to surgical procedure. The proper means must be adapted to the particular condition and has been discussed under the various operations already given.

Inflammation of the Urinary Tract.

Urethritis.—Inflammation of the urethra is generally associated with cystitis, of which it may be either resultant or cause. It may be produced by gonorrhœal infection or from traumatism—as from the use of the catheter. A painful form of urethritis is produced by the presence of a fissured or excoriated condition of the internal meatus.

The opportunities for the production of urethritis and cystitis through the use of the catheter are so frequent, the subsequent symptoms so marked, and the condition so obstinate, that it seems wise to consider the necessary precautions to adopt in catheterization in order to prevent its production. With the exercise of the *greatest care*, the frequent and long-continued use of the catheter is likely to cause an irritable condition of the urethra. The trouble is most frequently produced by want of cleanliness, for which the old method of introduction of the catheter by touch is mainly responsible. The catheter, the hands of the operator, and the vulva should be clean,

conditions which are incompatible with the practice of introducing the instrument without exercising the sense of sight. A glass catheter is the preferable instrument, as we can better see that it is clean. It may be boiled before using, or be kept during the intervals of its use in an antiseptic solution and scalded just before its introduction. Its surface should be anointed with sterile vaseline. The vulva and vestibule should be sponged with a warm antiseptic solution, the labia separated, exposing the external meatus, and the catheter carefully and gently introduced. The finger is held over the orifice of the instrument until a receptacle can be placed beneath it. After the urine ceases to flow the finger should again be placed over the orifice of the instrument before its withdrawal. This precaution retains the urine in the catheter and prevents the soiling of the external parts with urine.

Despite the precaution just given, urethritis is frequent from catheterization, hence wherever possible the patient should be permitted to void her urine without assistance.

The presence of urethritis may be combated by injections of (1 to 5 grains to the ounce) solutions of silver nitrate, zinc sulphate (2 to 6 grains to the ounce of distilled water), to which may be added $\frac{1}{2}$ fluidrachm of ext. hydrastis; zinc chloride 1 per cent. solution may be of advantage.

Gommaerts advocates a 5 per cent. solution of aluminol; Villetti a 2 per cent. solution of ichthyol, five to six times daily, which is gradually increased to 5 per cent.

In long-continued disease, especially when complicated by a fissured condition of the internal meatus, the promptest and most effectual relief is obtained by forcible dilatation of the urethra.

Cystitis is produced by gonorrhœa, extension of urethritis, infection from dirty instruments, from exposure to cold, and from overdistention of the bladder. When a large quantity of urine has been retained, the mucous membrane becomes anæmic from the great pressure. The complete evacuation of such a bladder would result in a sudden hyperæmia of its mucous membrane, which causes violent inflammation. Not unfrequently such cases will shed the entire mucous membrane, either in shreds or as a complete cast of the bladder. Cystitis is sometimes simulated by functional diseases of the bladder. In the former the urine will be cloudy, filled with mucus, phosphates, shreds of tissue, epithelial cells, and blood- and pus-corpuscles; in the latter it is generally clear.

The treatment consists in keeping the urine bland and non-irritating by a carefully regulated diet. All acid articles and highly seasoned foods should be excluded. In severe cases an exclusive milk diet should be advised. Large draughts of saline or ferruginous water

should be given. Such remedies should be administered as will render the urine alkaline or non-irritating. The bromides will often give relief. A very efficient prescription is:

℞. Ammon. benzoat., ʒiij (12.0);
Tr. hyoscyami, fʒiss (6.0);
Ext. buchu, āā. ʒij (60.0).—M.
Sig. A teaspoonful in water four times daily.

The bowels should be freely moved daily. Locally the bladder should be kept clean by irrigation through a double catheter with large quantities of hot normal salt solution, or some of the various local remedies which were advised for urethritis.

In obstinate cases the urethra should be dilated and the interior of the bladder carefully examined with the endoscope or urethral speculum. Local patches of abraded mucous membrane, ulceration, or papillary growths may be recognized and be treated locally. Silver nitrate (1 drachm to the ounce) applied on a small piece of cotton is efficient. The bladder should be immediately filled with a salt solution to neutralize the silver.

The patient may be placed under an anæsthetic for the necessary dilatation, or where the speculum has been previously used it may be reintroduced by previously swabbing the urethra with a 10 per cent. solution of cocaine. Mann has directed attention to the fact that a cystitis is often kept up by an attack of severe ureteritis. In such cases the orifices of the ureters will be noticed to be prominent and excoriated.

Edward Reynolds says that no diagnosis can be considered satisfactory unless the bladder is well dilated; when the dilatation is small, systematic inspection is prevented by the limitation of the field of vision. Small folds exist which are capable of hiding small lesions, and the trigonum is obscured by a small layer of urine.

He inserts into the urethra a pledget of absorbent cotton saturated with a 20 per cent. solution of cocaine and then dilates it to admit a No. 13 or 14 cystoscope. This is repeated at one or two more visits, after which a No. 12 cystoscope can be passed without pain. The knee-chest position affords the best dilatation of the bladder, but the trigonum is difficult of access and the position is uncomfortable for the patient. The position advocated by Kelly, in which the pelvis is elevated, is more comfortable, exposes the trigonum better, but affords less dilatation. The urine is more in the way. The Sims position is more comfortable for the patient, and midway between the positions already considered in the amount of dilatation and inconvenience experienced from the urine. The patient should be placed first upon one

side and then upon the other, in order that the entire field shall be exposed. The anterior vesical wall is difficult if not impossible to fully expose, but it is rarely the seat of exclusive disease. The trigonum is generally the part most seriously affected.

Ureteritis.—This condition is characterized by the symptoms of cystitis, with pain extending toward the corresponding kidney. By vaginal examination (Kelly) the ureter can be felt like thickened cord and extremely tender. It is palpated by placing the finger behind the cervix and drawing it forward, when the ureter will be felt to roll under the finger. Kelly has advised a linen woven catheter by which the ureter can be explored and irrigated. In addition to affording facility for treatment of disease of the ureter, it is valuable in determining the condition of each kidney, its activity and the character of its secretion. The procedure affords an opportunity to carry the treatment to the pelvis of the kidney. For inspection and treatment of the bladder and ureters Kelly suggests the following instruments: a female catheter, several urethral dilators, a series of specula with obturators, a common head-mirror and lamp, argand burner, or electric light, long delicate mouse-toothed forceps, suction apparatus for completely emptying the bladder, a ureteral searcher, ureteral catheter without handle, and several bran-bags or an inclined plane for elevating the pelvis. For a first examination the patient is given an anæsthetic. The bladder is emptied by a catheter. The urethra should be dilated with graduated bougies, up to 12 mm., which can be accomplished with a but slight external rupture. A speculum of the same size is introduced and its obturator removed. The patient's hips are elevated upon cushions or an inclined plane to the height of 20 to 40 cm. (10 to 12 in.) above the table. Light is reflected into the speculum by a mirror from an argand lamp. Where the latter cannot be secured, a candle can be made to serve the purpose. The introduction of the speculum in this position leads to the bladder being ballooned by the entrance of air.

All parts of the bladder may be inspected by moving the speculum in different directions. By elevating the handle of the speculum the base of the bladder and the inter-ureteric ligament is exposed. Turning the speculum 30° to one or the other side, the orifice of the ureter is observed as a dimple, a little pit, in inflammatory cases as a round hole in a cushioned eminence, or as a V with its point directed outward. It may be seen to discharge urine in spirts, or give exit to pus or blood. The surface should be carefully sponged with a hot boric acid solution before the introduction of the catheter. The catheter may be left in place for an hour or more. The urine which accumulates in the bladder necessarily represents the other kidney. In this way the kidneys may be isolated and the secretion of both studied through the

introduction of the one instrument. With the long catheter the entire ureter can be explored and the pelvis of the kidney irrigated.

MALFORMATIONS, TRAUMATISMS, AND OBSTETRIC LESIONS.

Malformations of the Genital Organs.

These may be congenital or acquired. Many of these conditions are of interest from a diagnostic standpoint, but present no new phases which entitle them to our consideration.

Atresias and *fistulæ* are of special interest.

Atresia may occur at the hymen, in the vagina, and at either the external or internal os in the uterus. The effect of the lesion will differ according to its situation. Associated with a normal condition of the other organs it may result in retention of the menstrual blood and of mucus in the vagina (hæmato-colpos) or vagina and uterus (hæmato-colpometria) or in large collection the tube may also be distended (hæmato-colpo-metrosalpinx); when the obstruction is situated in the cervix the collection occurs in the uterus and possibly also in the tube.

The danger of sepsis in operation upon such collections formerly led to the advice that the tumor should be opened by a mere puncture and the contents should be permitted to escape drop by drop. The possibility of rupture of a distended tube still leads many to advocate the slow evacuation of the pus-collection. The writer would advocate the evacuation of the collection by a free incision and thorough irrigation of the cavity with a mild antiseptic. The cavity should then be packed with iodoform gauze. The packing should be removed at the end of forty-eight hours. Drainage by rubber tube may follow the removal of the gauze. Subsequently difficulty may be experienced in maintaining the opening. Such an artificial opening, where it occurs in the vagina, may be prevented from closing by directing the patient to wear for a stated period each day a glass plug. Narrowing of a limited portion of the vagina may be remedied by one or two vertical incisions through the stricture to its base, and uniting the surfaces by sutures parallel to the incisions, which will widen the narrowed canal. In atresia of some length, after incision, flaps of mucous membrane may be dissected up and carried through the constricted portion to form a new vaginal canal. In *absent vagina* we have the choice between an operation to form a vagina or the removal of the ovaries, and possibly the uterus, where the latter is filled with

fluid. When we consider the difficulty of maintaining a vagina and the danger following a pregnancy, the latter procedure would seem the more advisable. Collections of fluid in one side of a double uterus or vagina offer difficulties in diagnosis. The treatment does not vary from that already described.

Fistulæ are generally traumatic, resulting from injury during labor. The fistulous openings between the neighboring viscera and the vagina are those between the genital and urinary tracts, four in number, the urethro-vaginal, vesico-vaginal, vesico-uterine, and uretero-vaginal. Those between the genital and intestinal tracts are ano-vaginal, recto-vaginal, and entero-vaginal. The general treatment of fistulæ has been discussed in the earlier volumes. Small fistulæ may be closed by flap-splitting operations. Thus, a trap-door flap may be lifted up, the opening closed by eye-silk or small chromicized catgut, and the flap stitched over it. In large fistulæ a flap-splitting operation will often permit the opening to be closed without any sacrifice of tissue. In very large fistulæ, where a good part of the anterior wall is destroyed, ordinary measures are futile for closing. The traction will be so great that the united tissues tear out. Such a fistula may be closed by transplantation of the bladder-wall (Bardenhauer). The patient is placed in the Trendelenburg posture, suprapubic cystotomy is done, and the bladder-wall dissected from the peritoneum and uterus until the fistula is reached. Adhesions and cicatrices are separated, the edges of the fistula are freshened, pressed together with the finger in the wound, and from the suprapubic opening silver-wire sutures are introduced, bringing them out upon the vaginal side. The catheter should be used every three hours.

A **uretero-vaginal fistula** may be closed by dissecting up the orifice, turning it into the bladder, and suturing the vaginal surface in such a way as not to compress the ureter. It is probable the more certain plan would be to open the abdomen, pick up the affected ureter and turn it into the bladder, doing what is known as a uretero-vesical anastomosis (Boldt).

Entero-vaginal fistulæ are most effectively closed by abdominal incision. The opening in the intestine closed, the vagina no longer demands consideration.

Traumatisms.—Injuries of the vulva and vagina are obstetrical and non-obstetrical. The latter are less frequent and arise from perforation by falling upon some body, or are injuries of coition. The treatment should be immediate and directed to the relief of the injury.

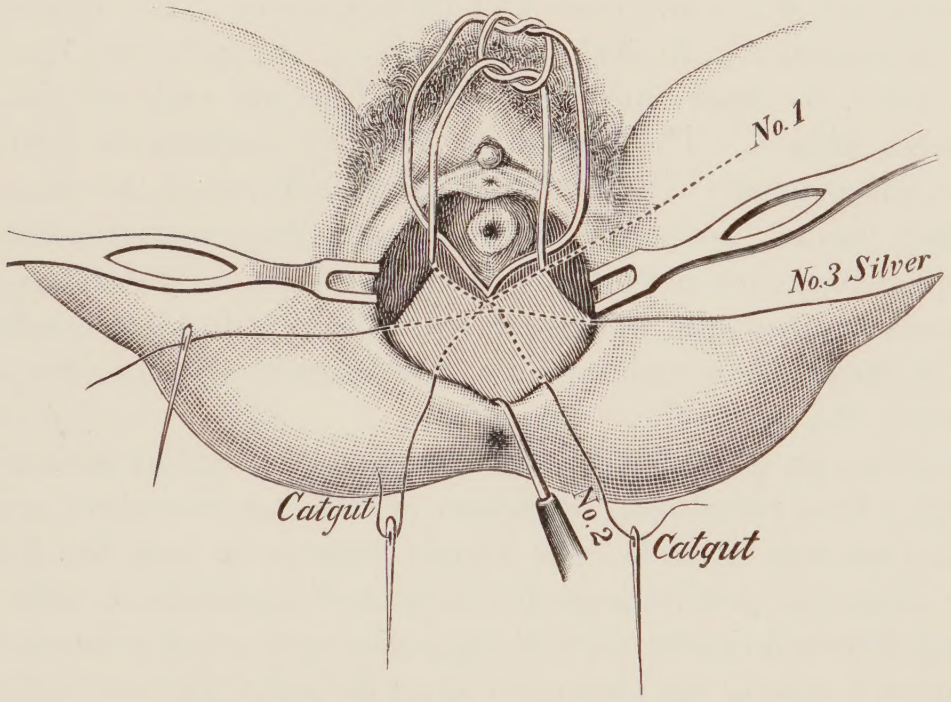
Obstetric Lesions.

Obstetric lesions are generally lacerations of the perineum during the progress of labor. Laceration of the perineum may be very slight

or quite extensive, involving the sphincter ani and the recto-vaginal septum. Where possible, every laceration should be immediately sutured. If the labor has been very long and the vulva is frayed and bruised by repeated and long-continued attempts to deliver with forceps, immediate closure is inadvisable, as the loss of vitality in the tissues will probably cause sloughing of the sutured surfaces, thus endangering the development of sepsis where drainage is obstructed by sutures. In the worst cases, however, an attempt should be made to secure control of the bowel by union of the recto-vaginal septum and of the sphincter ani, leaving the remainder of the perineum to be repaired by a secondary operation. Dr. Watkins, in Volume III. of this SYSTEM, has so accurately described his method of anterior colporrhaphy and the ordinary operations upon the perineum as to leave but little to be added.

Outerbridge modifies Emmett's operation by greatly shortening it. He uses but three sutures to coapt the denuded surfaces (Fig. 33).

FIG. 33.



Outerbridge's operation (*Medical Record*).

The upper suture is medium-sized catgut, ten or twelve inches long, with a needle at either end. One needle is imbedded in the crest and continued along the upper line of the denudation, coming out at the right upper angle in the undenuded tissue. The other is continued in the same manner to the left, coming out at the left upper angle. This suture is not tied, but the needles on either side are thrown over the symphysis temporarily. The next suture is of silver, and the needle is imbedded one-quarter of an inch above the denuded tissue, midway between the upper and lower points of denudation, or, in other words, at the highest point of denudation upon the left side of the labia, and

proceeds from left to right to a corresponding point upon the latter side, being throughout thoroughly imbedded. The upper suture is now tied, care being exercised to approximate the tongue or central portion and the right and left angles. One of the needles of this suture is then passed downward and outward from the central point under the denuded tissue and brought out at one side of the labia, about half an inch above the lower point or angle of denudation; the second needle is passed in a similar manner to the opposite side. This suture should now be tied, exercising care to draw it tightly. This completely closes the lower angle of denudation. The silver wire is next to be twisted. Occasionally one or two superficial sutures will be required.

This operation lifts the posterior wall up against the anterior, is easily done, and does not produce sloughing. But one suture will require removal. The writer, in complete laceration or in those lesions in which the sphincter is weakened, splits up the perineum and brings the surfaces together with No. 00 chromicized catgut, which is introduced as a continuous and buried suture. The first aim is to bring in contact the divided or torn ends of the sphincter ani muscle, and second, to draw into the median line the ends of the ischio-cavernosa muscle. The remaining denuded surfaces are brought together and covered with a row of catgut sutures in the skin. This operation makes no painful traction upon the wound-surfaces and consequently is not attended with much pain. By the use of the chromicized catgut the wound is sure to be kept in contact sufficiently long to secure firm union, while the patient is spared the anxiety regarding the removal of the sutures.

In more or less complete lacerations the operation should be preceded by free purgation, restriction of diet for two days to animal broths, and rest in bed. She should remain in bed for fully two weeks after its performance, be restricted to animal broths for one week, and should not be allowed the use of milk during convalescence. The bowels should be evacuated upon the third day and daily thereafter. The marital relation should not be resumed for six weeks.

Laceration of the Cervix.—The effect of laceration of the cervix will depend upon its extent. The slighter lacerations are of but little moment except as indicating the importance of treating the accompanying endometritis. Such lesions should not be considered as indicating operative procedure, for the decrease in the size of the cervical opening obstructs drainage and increases the danger of extension of disease to the deeper pelvic structures. The deeper lacerations, associated with eversion and hypertrophy of the mucous membrane, call for operative relief. The method of procedure will be dependent upon the complicating inflammatory lesions. A cervix with a deep

unilateral or bilateral tear in which there is but little induration of the lips, or eversion of the mucous membrane, may well be submitted to trachelorrhaphy. In laceration with hypertrophy of one lip, or eversion of hypertrophied mucous membrane, Schroeder's one-flap amputation of the cervix is the preferable procedure. The procedure should be chosen which will best remove the diseased structure and subsequently afford a good cervical canal for vent to its discharges. Dührssen advocates a flap-splitting operation upon the cervix by which the necessary denudation is accomplished without the sacrifice of tissue. Where the laceration extends through the cervix into the cellular tissue, a cicatrix results which draws the cervix toward the affected side. Martin overcomes this displacement by a circular incision upon the side of the uterus. Sutures are introduced parallel to the incision, which correspondingly increases the length of the lateral vaginal fornix. Hæmorrhage following either trachelorrhaphy or amputation of the cervix may be arrested by passing a suture deeply upon the side from which bleeding occurs, so as to obstruct the uterine artery.

DISPLACEMENTS.

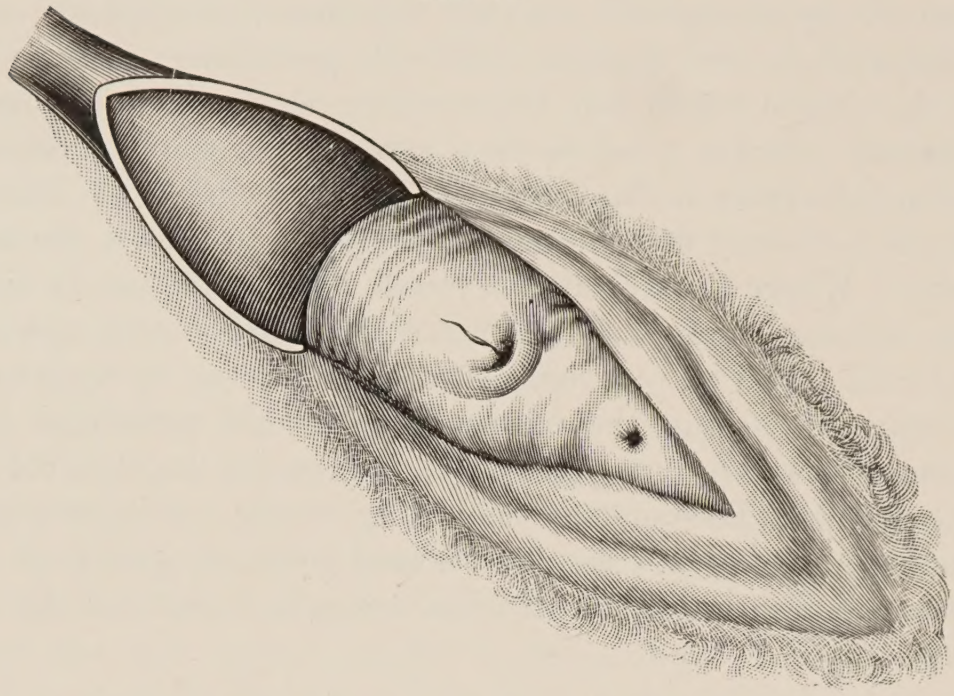
THE uterus may be displaced in any direction. The most important displacements are prolapsus, the retro-displacements, and anteflexion. *Anteversion* is a symptom dependent upon any cause which increases the weight of the organ. Its treatment, then, is that which is applicable to its cause.

Anteflexion may be congenital or acquired. The former exists in those cases in which there has been defective development, and the organ retains its puerile form with a cervix disproportionate to the body. The acquired anteflexion results from cold or exposure during menstruation, followed by inflammation; from inflammatory changes subsequent to parturition or abortion; or, from the presence of growths within the uterine walls. The displacement interferes with the proper performance of the functions of the organ, hence dysmenorrhœa and sterility result.

TREATMENT consists in relief of pelvic congestion, the use of hot vaginal douches and glycerin tampons, regulation of the bowels, and the exercise of proper hygiene. In the less severe forms the uterus may be dilated, curetted, and packed with gauze. The resulting exudation of the walls leads to an improved position and better drainage. If the flexion is situated in the middle or lower cervix, splitting the posterior lip will straighten the canal, afford relief during menstruation, and increase the probability of fecundation. The incision, how-

ever, inclines to close and contract. Dudley advises to split the posterior lip beyond the utero-vaginal attachment (Fig. 34). The sur-

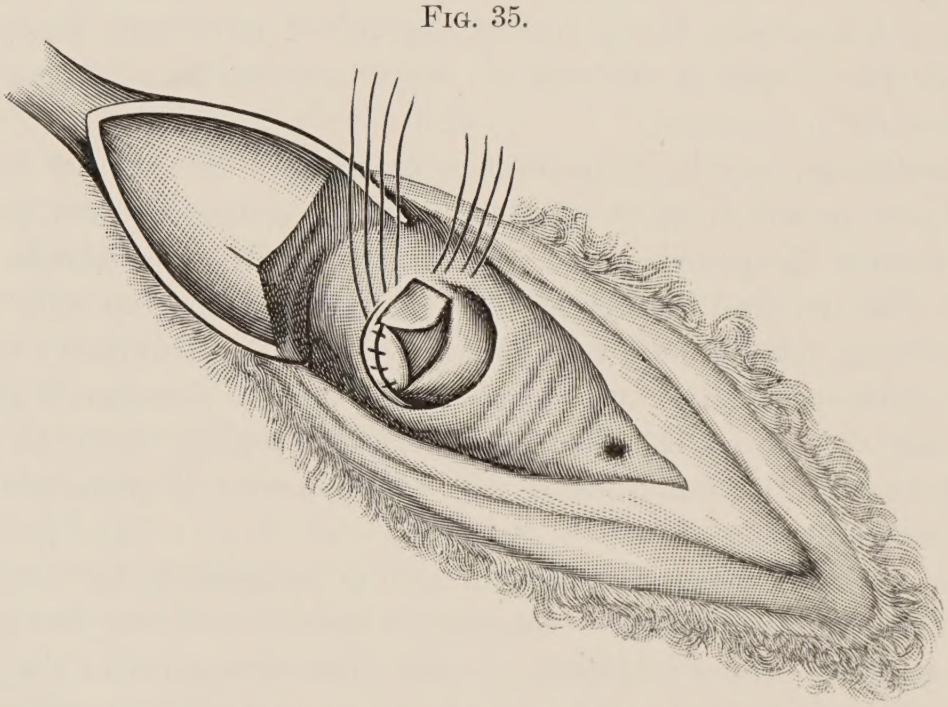
Fig. 34.



(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

faces are held apart by tenacula and the incision deepened, especially upon the cervical side, with the knife. The surfaces are then folded in and (Fig. 35) secured with silkworm-gut sutures, uniting the uter-

Fig. 35.

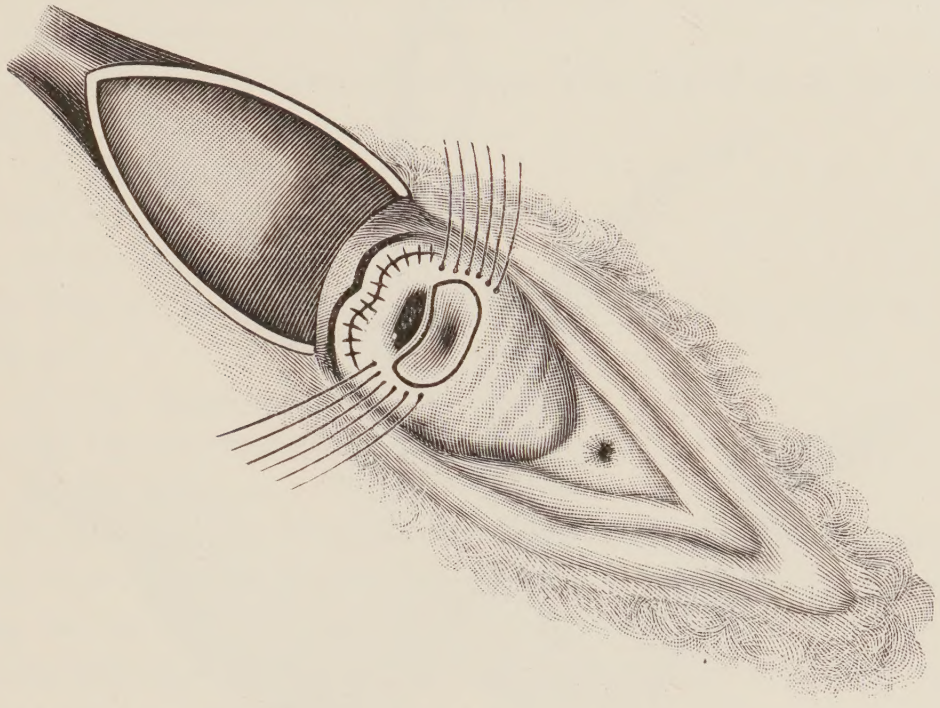


(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

ine and vaginal mucous membranes. The anterior lip of the cervix is amputated (Fig. 36), and closed with transverse sutures which push back the cervical orifice (Fig. 37). In flexion situated in the upper

third of the cervix, Vuillet dissects off the bladder (Fig. 38), makes a vertical incision upon a grooved director (Fig. 39) from above the

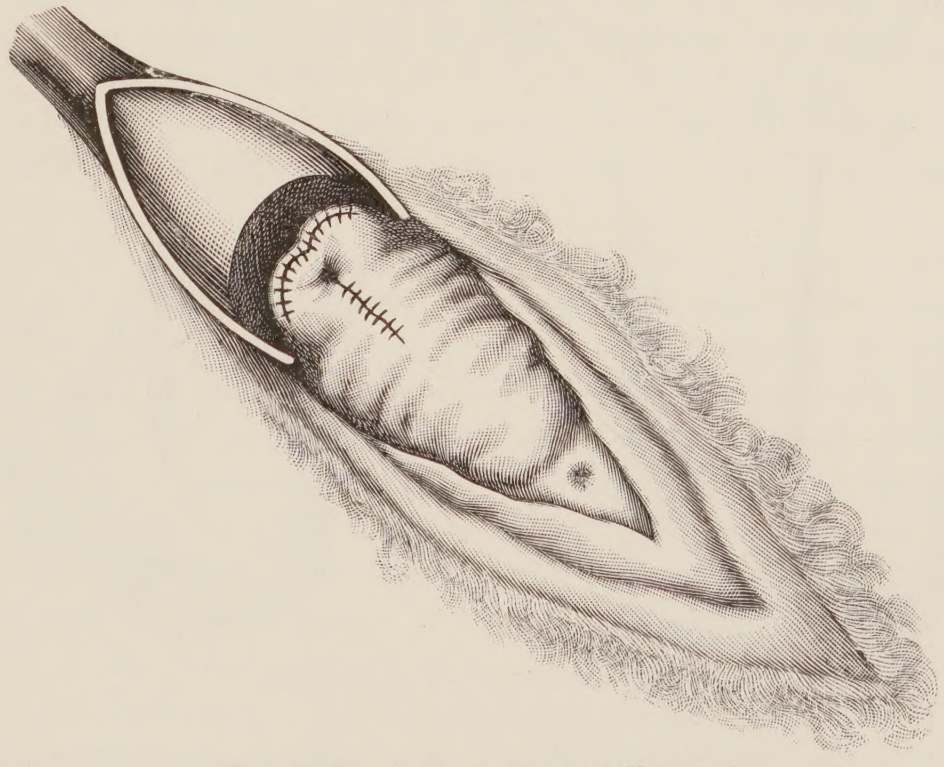
FIG. 36.



(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

point of flexion to the intervaginal portion of the cervix (Fig. 40); from this point an incision is carried transversely around the cervix,

FIG. 37.

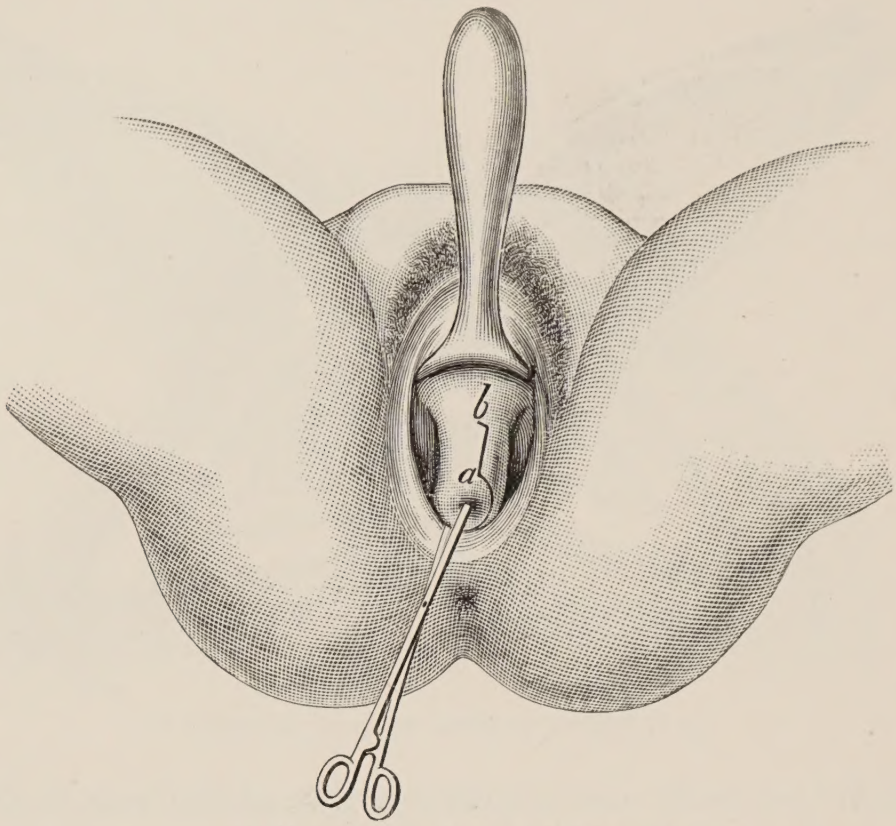


(E. C. Dudley, in *Amer. Journ. of Obstetrics.*)

ending posteriorly. This flap is turned up and sutured into the cervix, increasing the size of the canal. The vaginal wall is sutured with catgut.

The recognition that the flexion corresponded to the shorter wall led Nourse to devise an operation to shorten the long wall. He

FIG. 38.



(Vuillet, in *Ann. Univ. Med. Sciences.*)

splits the uterus into halves and slightly above the flexion makes traction upon the long wall, and sutures the incision on either side.

FIG. 39.

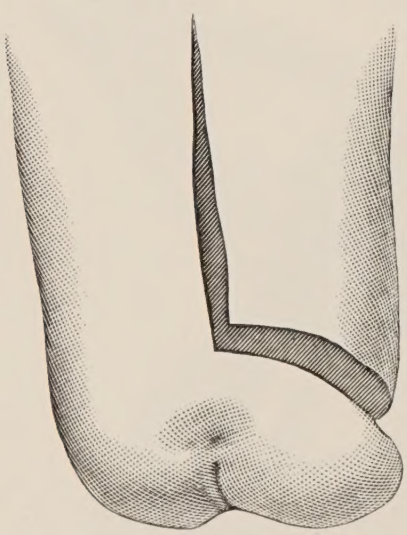
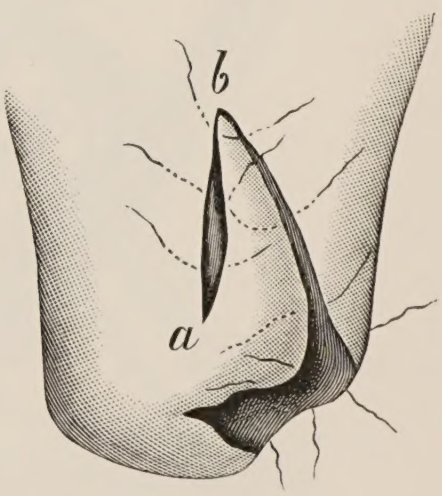


FIG. 40.



(Vuillet, in *Ann. Univ. Med. Sciences.*)

The longer lip may be amputated or permitted to contract and heal by granulation. The operation should be immediately preceded by a curettement and disinfection of the uterine canal, otherwise there may be danger of pelvic infection. The operation is quite effective in either anterior or posterior flexion.

Retro-displacements of the uterus are the most frequent form of malposition. They are divided into versions and flexion. The treatment of the two conditions varies but little. It is divided into—

1. *Replacement.*

2. *Maintenance in normal position.* The retention of the uterus in a replaced position is accomplished—

(*a*) By mechanical means.

(*b*) By massage.

(*c*) By operative procedure.

The first division, the replacement of the uterus, may be accomplished—

(1) By combined manipulation.

(2) By instruments.

(3) By position.

As these methods of procedure have been described in an earlier edition, it is unnecessary to discuss them further than to discountenance the use of the intra-uterine sound or repositor. These instruments cannot accomplish the purpose, however carefully handled, without more or less traumatism of an organ whose position necessarily renders it irritable and susceptible to the onset of an inflammatory attack.

Pessary.—We cannot regard the introduction of a pessary as a justifiable procedure unless the uterus has been carefully replaced. The use of a pessary without complete replacement is prone to convert a version into a flexion and to aggravate the trouble. Pessaries should not be worn when there is any fixation of the uterus. Adhesions incline to draw back the fundus and produce discomfort and suffering.

Massage is an agent the value of which has not been appreciated in pelvic diseases. Recent adhesions may be readily overcome and the pelvic distress relieved by its use. Careful selection should be made of cases. The presence of collections of liquid, whether pus, blood, or serum, contraindicate its practice. The method of Schultze, as well as the operative procedures for fixation without opening the peritoneal cavity, is to be condemned. They are blind procedures, capable of much and serious injury without affording an opportunity to recognize and remedy it.

The Alexander-Adams operation has a limited application. It is contra-indicated when there are any perimetritic adhesions, and we have no means of absolutely determining their absence. Many modifications of the operation have been introduced. Newman makes his opening over the internal inguinal opening; he claims for this modification that the ligament is drawn straight out, with greater ease, and that it requires but little dissection. Edebohls lays open the canal

throughout its entire length. The ligament is fastened by silk, silkworm-gut, catgut, or silver wire. The superfluous portion is either cut off, folded up beneath the subcutaneous fascia, fastened by a knot to the opposite ligament, and buried in the incision connecting the two wounds, or the ends are pushed through the fascia and united by sutures.

VENTRAL FIXATION, or suspensio uteri, has the advantage over the preceding operation that it is applicable to any displacement; it requires but a single short incision and affords an opportunity to inspect and treat any disease of the pelvic organs. The most valid objection to it is that it has been provocative of trouble in subsequent gestation and parturition. This difficulty is probably overcome by exercising care not to make too broad a band of adhesion or include more than the peritoneum in the sutures fastening the uterus forward. This course, it is claimed, makes a long, slim band of adhesion. Two sutures of fine eye-silk are passed through the peritoneum and fundus, and are buried.

SHORTENING OF THE ROUND LIGAMENTS is practised from within the abdominal cavity. The middle portion of each broad ligament is sutured with a loop (Wylie), the centre of the middle portion is sutured against the side of the uterus (Dudley), or a suture is passed through the middle portion of one round ligament, though the anterior surface of the fundus uteri and the opposite ligament, when it is tied, swinging the uterus forward (Mann).

Various procedures have been devised to fix the uterus to the abdominal parietes without opening the peritoneum. Baum of Kansas City dilated the uterus and passed to its fundus an instrument by which the organ was carried against the abdomen, and two needles armed with a silkworm-gut suture were thrust through it and the abdomen, between the points the skin was incised and the suture buried. King pushes the fundus against the parietes, makes an incision to the peritoneum and introduces one or two sutures. Both procedures are blind and consequently to be condemned. Still more objectionable is the operation devised by Schucking, which consists in passing by a spring needle a suture through the fundus into the vagina and tying it. The operation brings the uterus into extreme anteflexion. Besides maintaining the uterus in an abnormal position, it endangers the ureter and bladder.

Several operations have been devised by way of the vagina. Mackenrodt made a vertical incision through the anterior vaginal wall, pushed up the bladder, opened the peritoneum, drew forward the uterus and sutured it to the vaginal walls. Where the uterus is held back by adhesions, it is not always easy to separate them through an anterior vaginal incision; the uterus has frequently been so injured

in trying to bring it forward that hysterectomy was resorted to in order to complete the operation. The most serious objection to the procedure, however, is that it has been found to seriously interfere with the progress of subsequent gestation and parturition. Nearly as objectionable is the procedure known as vesico-fixation, in which the attempt is made to obliterate the vesico-uterine fold. Wertheim advocates drawing down, through the anterior colpotomy, each ligament and fastening it in the vaginal wound. The writer has been much pleased with the ease with which he could fasten the round ligaments to the anterior fundal surface through an anterior colpotomy, and is disposed to advise it in preference to the plan proposed by Wertheim.

Gottschalk operates through a posterior vaginal incision. It enables him to break up adhesions and renders the uterus movable. He then introduces a suture through the middle portion of the utero-sacral ligament and the side of the cervix, and a second ligature upon the opposite side. These ligatures tied, the cervix is drawn backward and upward.

In retroflexion with extensive adhesions, a posterior vaginal incision permits the adhesions to be broken up, the uterus brought forward, and the pelvis packed with a large quantity of gauze, which is permitted to remain nearly a week (Pryor).

Prolapsus Uteri.—We do not consider it necessary to discuss the various tentative and radical procedures which have been given in previous editions, but will call attention to Dudley's lateral colporrhaphy. It consists in denuding a surface, beginning at the side of the uterus and extending along the lateral surface of the vagina to the vulva. The sutures are so introduced as to raise up the long posterior vaginal wall. While this operation retracts the vagina and holds it for support to that wall which is least likely to give way, it is yet at fault in that it leaves a heavy uterus free to be subsequently driven through the narrowed canal and the displacement to become re-developed.

Baldy advocates opening the abdomen, doing supravaginal hysterectomy, and securing the stump from displacement by a ligature on either side from the broad-ligament stump.

Noble suspends the cervix from the abdominal parietes.

NEOPLASMS; TUMORS AND CYSTS.

Neoplasms.—New growths are benign and malignant. Those of the vulva have been fully described. The vagina rarely is the site of origin for anything more than small cysts.

The uterus is frequently the source in which a variety of growths known as *fibroids* originate. They may be multiple or single, and vary greatly in the character of their symptoms according to the situation. The submucous and interstitial are prone to the production of hæmorrhage, the subperitoneal may be unsuspected until accidentally discovered. Small subserous growths may exist for years without the production of symptoms. It is better that the patient should not be informed of their existence, as the knowledge unnecessarily adds to her worriment.

The treatment is medical, electrical, and surgical. The medical treatment has been given; it is capable of delaying the progress of growths, decreasing hæmorrhage, and, where the growth is favorably situated, expedites its extrusion from the uterine wall, either as a submucous or subperitoneal tumor.

Electricity.—It was once claimed that this agent was efficient in curing not only symptomatically but radically. Practice, however, has demonstrated that while it is capable of affording relief from pain and hæmorrhage, it has but little if any influence in reducing the size of the tumor.

While it has a beneficial influence in arresting hæmorrhage, and consequently is a valuable adjuvant where the condition of the patient is such as to preclude any operative interference, it is not so expeditious or effective as many comparatively simple surgical measures. No better demonstration of the inefficiency of electricity in reduction of the size of fibroid growths should be required than the result in the Berlin clinics. Of 143 cases in which Apostoli's treatment was carried out, there was but one in which there was a radical cure, and that was in a tumor the size of a fist. In another, a tumor of the submucous variety was expelled from the uterus following intra-uterine galvanism. In 107 cases treated by Nagel and Mackenrodt no appreciable diminution in size was seen. All agree that for the relief of hæmorrhage and pain it was beneficial in 60 to 70 per cent., but relapses were frequent among those relieved, while 30 to 40 per cent. were unrelieved or were made worse. The symptom of hæmorrhage may be much more rapidly and permanently checked by the use of the curette and injections of iodine.

Surgical Resources.

In the surgical procedures we find the most effective and rapid method of dealing with fibroid growths of the uterus. The method will depend, of course, upon the size of the growth, its situation and the amount of the uterus involved. The methods of procedure may be classified, according to the direction in which the mass will be approached, into the vaginal or abdominal. Under the *vaginal* we

have dilatation of the neck, incision of the neck, curettage, myomectomy, ligation of the uterine arteries, and vaginal hysterectomy. By the *abdominal* we have castration, ligation of the ovarian arteries, myomectomy, hysterectomy partial, hysterectomy complete. The vaginal route will be preferable in the submucous or interstitial varieties, where it is possible to enucleate the tumor and leave the uterus. It is also used in those cases of removal of the uterus where the organ is not too large to come through the vagina, or where it can be readily removed piecemeal. Dilatation of the uterus may be done for diagnosis, or exploration of the uterine cavity in cases of doubt in which hæmorrhage is particularly a symptom. Dilatation of the uterus in growths of some size which have become submucous, facilitates the extrusion of the tumor into the vagina or the more rapid separation of the tumor from the uterus. This condition also may be facilitated by an incision of the neck. In a tumor which is of considerable size, of the submucous variety, filling up the cavity of the uterus, the incision of the neck, weakening the resistance of the cervix, will facilitate the delivery of the mass. Incision also affords an opportunity to explore the uterine cavity, and in cases in which it is not deemed advisable to resort at once to operation, in which hæmorrhage is a symptom, it will permit of the incision of the uterine mucous membrane over the surface of the tumor, the consequent contraction of the blood-vessels and arrest of the hæmorrhage. Where hæmorrhage is a marked symptom, one of the most effective methods of its control is by the use of the curette. This should be preceded by dilatation of the neck in order that there should not be defective drainage and accumulation of fluid in the uterine cavity. The curettage brings about a renewal of the uterine mucous membrane, contraction of its blood-vessels, recovery of the health of the patient, and arrest of the symptom hæmorrhage.

Myomectomy.—By this term we mean cutting off a fibroid. This is particularly applicable to fibroid polypi, which usually hang by a distinct pedicle. The removal of the fibroid, if it has a small pedicle, may be readily accomplished by seizing the tumor with a strong volsella and twisting it until the pedicle is torn off, or again, where it is larger and firmer, it may be removed by the use of the scissors. When the pedicle is cut through, it is well to seize the part and apply the Paquelin thermo-cautery to the base, which, while it prevents the danger of infection of this surface, also destroys the stump and decreases the probability of the development from it of another fibroid. Where myomectomy is done, removing a large mass from the uterine cavity, it is better after its delivery that the uterine cavity should be thoroughly irrigated, using for this purpose a normal salt solution, and then packing gently with iodoform gauze. The

object of doing this is to prevent accumulation of fluid in the uterine cavity, which may undergo infection by the presence of pathological germs in the air, or which have been brought to it by the finger or instruments in the manipulation. This packing may remain in the uterus from three or four days to a week; when it is withdrawn the cavity should be thoroughly irrigated and a smaller packing introduced.

Ligation of Uterine Arteries.—In tumors of moderate size, where a large amount of uterine structure is not involved, it may seem undesirable that so radical an operation as extirpation of the uterus should be performed. Indeed, it should be our purpose to save the structures whenever it is possible to do so. Franklin Martin has suggested the ligation of the uterine arteries through the vagina. An incision is made first upon one and then upon the other side of the cervix, partially encircling it; after cutting through the mucous membrane the cellular tissue is reached, the peritoneum is pushed backward, burrowing up into the broad ligament until the uterine artery can be distinctly felt. This is secured by passing a ligature about it, tying it firmly. The opposite ligament is treated in a similar manner. In cases in which hæmorrhage has been very profuse we may burrow further in the broad ligament on one side until the ovarian artery is reached and secured by a ligature, so that subsequently the tumor receives its nutrition only through the remaining ovarian artery. The decreased nutrition necessarily results in arrested growth, if not in diminution of the size of the tumor. From a number of operations which have been performed by Martin and others very satisfactory results have been obtained.

Vaginal Hysterectomy.—Vaginal hysterectomy may be performed in all cases of fibroid growths of small size, whether single or multiple. The method of performance of this operation has already been described under the head of inflammatory diseases of the pelvis. The operation consists, after thorough cleansing of the abdomen, in an incision around the cervix through the vaginal mucous membrane, preferably by means of a thermo-cautery knife, as this decreases the amount of bleeding from the superficial vessels and at the same time affords better drainage, as the burnt surface does not heal up so quickly by granulation. After cutting through the vagina, the tissues are pushed off in front between the uterus and bladder until the peritoneum is reached, in a similar manner, posteriorly. Having reached the peritoneum a pair of clamp forceps are applied on either side, to secure the uterine arteries. The secured portion of the broad ligaments is cut off from the uterus and the cervix amputated near the level of the internal os. This permits the more ready rotation of the uterus, to bring out the fundus. If fibroid masses of considerable size are in the fundus of the uterus and are too large to

permit the entire mass to be brought down, the capsule may be incised, the tumor enucleated, and a number of fibroids removed in this way. After rotation of the fundus and withdrawal of the ovary and tube, a pair of clamp forceps is applied upon the left broad ligament securing that portion not secured by the first clamp, the broad ligament is cut through, the opposite ovary and tube are then turned out and the clamp applied to the broad ligament external to them.

The subsequent treatment of the wound is similar to that which is practised in vaginal hysterectomy for inflammatory troubles. It is important, however, for the control of hæmorrhage that the clamp forceps should remain for a longer period than in the inflammatory cases; indeed, seventy-two hours would seem preferable, for the reason that the vessels are much larger and consequently there is increased tendency to hæmorrhage.

In fibroid tumors of considerable size we may still resort to the vaginal procedure, doing what is known as *morcellement*—the removal of the mass in pieces. For the proper performance of this operation it is necessary to have several double tenacula so that the parts can be held firmly without slipping, and a portion of the mass is seized with a double tenaculum and a piece of tissue cut out. Before the tissue is entirely removed another tenaculum can be inserted, and a tenaculum constantly be kept in the more solid tissue, so that the tumor may not be displaced and thus render it difficult to again secure it. Hæmorrhage is controlled by seizing the blood-vessels in the capsule with a pair of hæmostats, or, as the dissection progresses and the pedicle or broad ligament is drawn down, the control of vessels may be accomplished in a similar manner to the performance of vaginal hysterectomy. With the completion of the removal of the mass the wound is also treated in a similar way. This operation is very popular with the French surgeons.

The *abdominal* procedure also enables us to cut off the blood-supply without the sacrifice of the organ. This operation, introduced by Byron Robinson of Chicago, consists in ligation of each ovarian artery, and after separating the broad ligament making a second ligation in the anastomosis of the ovarian and uterine arteries about midway between the internal os and fundus of the uterus. This cuts off to a large degree the supply of nutrition to the fundus of the organ and permits its subsequent reduction. This operation is fully as effective as the one formerly practised of castration.

Castration is the ligation of each broad-ligament pedicle and the removal of the ovaries. This procedure, however, is not always effective in control of hæmorrhage. In some cases the hæmorrhage is just as great after the removal of the ovaries as before; these are cases, probably, in which the ligation only secures the ovarian branches to

the ovary and tube and does not obstruct the ovarian artery. The passage of the ligature in such a way as also to include the round ligaments renders it more certain that the ovarian artery is included in our ligature.

Myomectomy.—This operation is applicable to all those cases in which the tumor is more or less separated from the body of the organ by a pedicle or neck. In such cases the operation can be readily done with but little hæmorrhage and no severe constitutional effects. If the tumor is attached to the uterus by a broad base its wall may be incised and the tumor itself enucleated. The cavity thus formed, after being carefully trimmed and the shreds of tissue removed, may be closed by turning in its edges and using a continuous catgut suture. The peritoneum over the first row of sutures may be again sutured, making a thicker wall.

Hysterectomy for fibroids is an operation which has been practised for quite a long period. The first operation was probably done by Burnham of Lowell, Mass. The later methods of procedure have rendered the operation of little danger, and consequently it is more frequently practised. The operation may be done by bringing the stump composed of the cervix uteri out through the lower angle of the abdominal wound, in which it is fixed by the insertion of pins. It is then secured beneath the pins by a serre-nœud or the application of an elastic ligature, the peritoneum being stitched to that of the stump beneath the ligature. This procedure results in the separation by a process of sloughing of the external stump, which renders it exceedingly difficult to keep the wound aseptic and prevent suppurative processes in it. After the separation of the external portion of the stump the pedicle retracts, leaving a deep sulcus which must fill up by granulation, and the consequence is that we necessarily have a prolonged convalescence and a weakened ventrum which may result in subsequent ventral hernia. For this reason other methods of treatment of the pedicle or stump were urgently sought.

The operation as devised simultaneously by Eastman, Goffe, and Baer consists in ligation first of that portion of the broad ligaments containing the ovarian arteries, incision between the clamp forceps and the ligature, separation of the peritoneal surfaces, carrying a flap forward in front through the peritoneum, and a second posteriorly. A second ligature is applied on each broad ligament in such a way as to include the uterine artery. Having secured the patient against hæmorrhage in this way, the parts are separated and the tumor removed, making the incision through the stump at or below the external os. Having removed the mass and made sure that hæmorrhage is completely arrested we may proceed to the sterilization of the remaining cervical canal. This may be done by the

introduction of the thermo-cautery, the use of carbolic acid, and if there is much space in the tissue above from which oozing is likely to occur, it may be packed with iodoform gauze, taking the precaution to pass its end through the cervix so that it may be removed by the vagina. The peritoneum should be stitched over the gauze so that the stump is entirely shut out from the peritoneal cavity, and we have consequently an extra-peritoneal treatment of the stump.

Where the cervix is large or taken up to a great degree by the tumor, complete hysterectomy will be preferable. In the performance of this operation ligatures are applied in a similar manner, the second ligatures at a sufficient depth to make sure that the uterine arteries are secured, then, making an incision through the posterior cul-de-sac into the vagina, the finger is introduced and the stump left by the previous removal of the fundus uteri is cut around and completely removed. After cleansing the vaginal surface it is united by sutures and the peritoneal surface closed, making the operation a clean one so far as the peritoneal cavity is concerned. This operation is fully as efficient, and the mortality no greater, than in partial hysterectomy.

In the removal of fibroid tumors there are special difficulties which demand particular consideration according to the situation of the growth. Not infrequently we shall find the growth situated in a broad ligament, compressing or displacing a ureter, so that the removal by the way we have just mentioned will be exceedingly difficult and greatly endanger the continuity of the ureter.

We may ligate both ovarian arteries in mass if practicable, then ligate the deeper portion of the broad ligament upon the free side, and tilt the uterus (Pryor), cut from one side to the other across the cervix (Kelly); the bladder having been previously separated we ligate the lower portion of the ligament, which includes the uterine artery, and roll out the tumor, having it connected only by the spread-out folds of the broad ligament, which can now be easily separated without danger of injury to any of the viscera. If the ovarian artery has not been previously secured it can now be ligated.

Tumors of the Tubes and Ovaries.

Fibroma of the tubes is rare; of the ovary, more frequent, but in less proportion than cystoma. The treatment is removal, but it does not differ from the operation of ovariotomy. The treatment of such tumors of the tube as pyosalpinx, hydrosalpinx, and hæmatosalpinx has already been described under the head of inflammatory diseases.

Tumors of the ovary are divided into large and small. The large tumors comprise the glandular and papillary, proliferating, and the dermoid. The small cysts are (1) the small residual cyst of Morgagni; (2) the follicular cyst; (3) cysts of corpus luteum; (4)

tubo-ovarian cysts. The small cysts only demand treatment when they give rise to symptoms, which is much less frequently than is suspected. The treatment may consist in ovariotomy, or the resection of the ovary, saving as much of the healthy structure as possible.

The only treatment of large cysts is *ovariotomy*. In very large cysts, where the danger of shock is great, a few days' preliminary tapping may be done. The details of ovariotomy are given in Volume III. Occasionally an ovarian tumor will be found presenting adhesions of such a character as to preclude its removal. Such cases in the hands of experienced and skilled operators are exceedingly rare. When it is decided to retain the cyst, it should be opened, and its cavity gone over with the hand. Partitions should be broken down, the cavity irrigated with a normal salt solution, and subsequently packed with iodoform gauze. The opening in the cyst should be stitched to the abdominal parietes to prevent infection of the peritoneal cavity.

Dermoid cysts should not be tapped and particular care should be exercised that the cyst does not rupture during removal, as its contents are exceedingly infectious.

Broad-ligament Cysts.—These growths should be removed. It is true that they sometimes disappear after an accidental rupture or a tapping, but the result is not sufficiently certain, nor can we always be so confident of our diagnosis as to render the treatment by tapping justifiable. The writer has recently seen a small cyst of this variety whose pedicle had become twisted and cut off the circulation, resulting in death of the tumor. The patient had had repeated attacks of right inguinal pain, simulating appendicitis and so diagnosticated.

In the removal of broad-ligament and intra-ligamentary ovarian cysts great care must be exercised not to injure the intestine, the bladder, and particularly the ureter. The latter will often be found closely adherent to the cyst-wall. Not infrequently it will pass directly over it and will be cut or torn unless the enveloping tissue is carefully examined.

Rupture of the ureter demands immediate attention, and various methods have been practised: extirpation of the kidney, ligation of the ureter, establishment of a urinary fistula, anastomosis with the colon (Van Hook), uretero-ureteral anastomosis (Kelly, Bache Emmett), or uretero-cystotomy (Novaro, Kelly, Krug, Penrose, Baldy). Removal of the kidney—in the duration of operation and the necessity for increased dissection—adds much to the danger for the patient.

Ligation must be supplemented by the use of a second ligature or there will be leakage, as the tissues soften under the ligature. As soon as the pressure from the accumulation equals the blood-pressure, secretion ceases and the kidney ultimately atrophies. The success of

this procedure, as well as that of extirpation of the kidney, is largely dependent upon the condition of the other kidney, as it must do all the work. Intestinal anastomosis is unsatisfactory. The introduction of urine into the intestinal canal from its irritation increases peristalsis and thus occasions annoyance. The danger of infection of the kidneys is not insignificant.

Anastomosis between the two ends of the ureter presupposes that they can be readily brought together, and that the peripheral end is patulous and can be made to receive the upper end without obstruction. The end of the peripheral portion should be closed and the communication be made through a slit in its side.

Undoubtedly, where it can be accomplished the direct implantation of the end of the ureter into the bladder is the most desirable procedure. The point of entrance should be made at the upper part by a small incision, the muscular walls should be united by fine catgut and a second row of sutures to the external surfaces. No traction should be made upon the ureter by the bladder. If it has been necessary to somewhat displace the bladder, it should be anchored to the surrounding tissue to prevent dragging upon the ureter. Drainage should be used to afford vent for any possible leakage. Intestinal and bladder lesions should be carefully sutured before the wound is closed.

Malignant Neoplasms.—Under this title may be classed the various forms of cancer and sarcoma. They may affect any part of the genital tract, but primarily, most generally, the uterus or vulva, rarely the vagina. While malignant disease is most frequently found to occur near the climacteric, it may affect the woman at any age, whether married or single. When the disease occurs early in life, either from inability of the system to resist its ravages or from special susceptibility to its influence, the progress is rapid. Medicine, either local or general, has afforded us but little assistance. So-called specifics have been advocated, but their efficacy is only apparent to those who have introduced them. Recently, various remedies have been given hypodermically with the purpose of arresting the progress of the disease. These remedies are injected into the diseased structures. As the majority of the cases have passed beyond the stage when hope for cure by any operative procedure can be entertained, it seems but proper that such investigations should be continued. Despres makes deep injections of refined petroleum, which, while painful, cause speedy separation of sloughs, desiccation of ulcerated surfaces, and disappearance of odor.

Schultze of Buda-Pesth and Vuillet of Geneva advocate the use of absolute alcohol; the latter injects it by a number of syringes deeply into the indurated tissue, permitting the instrument to remain some

time to prevent the fluid running back through the needle-track. It causes hardening of the tissue and gradual separation of the diseased tissues.

Lewis and Boldt have given pyoktanin hypodermically with beneficial results. It should not be given in doses larger than gr. iiss at any one sitting.

Bernhardt advocates the use of a 6 per cent. solution of salicylic acid in alcohol at 60°. Seven or eight injections of a few drops should be given at each sitting, the whole quantity not to exceed ℥xxxj.

Where the disease is too extensive for radical cure we have to consider palliative measures. The progress of the disease may be arrested or delayed by the use of the sharp curette, followed by the application of a caustic. The most effective caustic is undoubtedly the zinc chloride. Great care must be exercised in the use of this agent to confine its destructive qualities to the diseased tissue. Without special precautions the vagina and vulva are prone to become burned, sometimes to the destruction of the vaginal walls. The actual cautery is another valuable agent. Its application is somewhat difficult, as the thermocautery becomes so cooled by the blood that it requires frequent reheating.

These measures arrest hæmorrhage and cause sloughing of the broken-down tissue and cicatrization of the diseased surfaces. The arrest of the severe drain soon produces a greatly improved condition and appearance, but unfortunately it is only temporary. In bad cases the disagreeable odor, the pain, and the hæmorrhage are the symptoms which will demand especial consideration. The vagina should be irrigated with large quantities of hot water, salt solution, peroxide of hydrogen and water, a solution of listerine, or the chlorinated waters, of which one of the best is a preparation known as electrozone.

Lucas advises the following powder as a dressing: Benzoin, iodoform, magnesii carbonat., āā. ʒij—which will arrest and diminish the fœtid discharge and prevent excoriation of the vulva and vagina. Hæmorrhage is controlled by injections of hot saturated solution of alum, the use of perchloride of iron, followed, if necessary, by gauze packing.

Pain frequently is so severe as to require the use of large quantities of anodynes. While in hopeless cases we should have no hesitation as to the formation of the opium-habit, yet it is better for the patient that its use should be delayed so long as relief can be maintained by other drugs. The agents which may be serviceable are belladonna, hyoscyamus, chloral, antipyrin, and acetanilide. When opium is given, it should be husbanded so that its effect may not be exhausted

before the disease has run its course. It may be given by the mouth, in the form of a suppository by the rectum, or hypodermically. The use of the hypodermic syringe should not be placed in the hands of the patient or a member of the family, as the quantity of the drug will be augmented too rapidly.

Operation.—None of the measures we have given should be for one moment considered where the case is operable. When the disease is confined to the uterus, whether it originated in the cervix or body of the organ operation, should be advised. We may choose between high amputation and extirpation. It seems just as desirable to get well beyond the confines of the disease when it originates in the uterus as in involvement of the mammary gland, consequently hysterectomy should be preferred. This operation may be done either through a vaginal or abdominal incision. If the disease is confined to the canal of the cervix or to the body of the uterus, the vaginal operation is the preferable procedure, as by it the uterus can be removed in less time and with less dissection. The operation may be done with the use of ligatures to prevent hæmorrhage, or we may resort to clamps. The latter method of hæmostatasis is preferable, for the reason that it can be performed more expeditiously and no ligatures remain to become infected and keep up subsequent discharge. In extensive involvement of the uterus, extending upon the vagina and with a suspicion of extension into the broad ligaments, the abdominal incision affords the best opportunity for thorough removal. It permits an inspection of the condition of the pelvic contents and removal of a large amount of tissue. Clark and Kelly have advocated the previous introduction of catheters into the ureters, but the danger of breaking a catheter, the difficulty in the subsequent removal of the fragments, and the fact that such landmark is unnecessary render it inadvisable.

The principal dangers in the operation are hæmorrhage and injury to the ureters. When it is apparent that they are liable to injury or ligation it is better that the peritoneum should be opened, and the ureter raised and held to one side while the dissection and ligation are accomplished.

Generally hæmorrhage can be prevented by ligation of ovarian and uterine arteries, but in extensive involvement of the pelvic floor, where the disease extends upon the vagina, the ligation of the anterior trunk of the internal iliac arteries (Kelly, Polk) may be practised. Ordinarily this arrests the circulation in the superior, middle, and inferior vesical, the middle hæmorrhoidal, the uterine, the vaginal, the internal pudic, the obturator, and the sciatic, but the distribution of the vessels between the anterior and posterior trunks is uncertain and the anterior trunk is frequently very short (Pryor), so that the writer in a recent case

ligated both internal iliac arteries. The ovarian arteries had previously been ligated. The tissues were then cut away without the necessity of any further ligation. The ligation of the entire vessel only arrests the circulation, in addition, through the lateral sacral, the ileo-lumbar, and the gluteal arteries. The tissues supplied by these vessels are capable of being cared for by the collateral circulation. In addition to the better control of hæmorrhage, the more expeditious operation, the greater security for the ureters in that they are under observation, this procedure affords a hope that any portion of malignant disease unremoved may disintegrate and be thrown off, owing to its circulation being temporarily arrested. The diseased tissue being less highly organized is more easily starved.

The surgical treatment of pelvic cancer should not be dismissed without reference to the readiness with which malignant disease of the uterus can be reached by the operation of sacral resection. The extent of dissection and injury to bone-structures will forbid its practice unless the affection of the uterus is complicated with involvement of the rectum. This section permits the diseased organs to be attacked directly from behind, where the ureters are readily observed and avoided, the vessels easily ligated, and the organ most readily accessible.

THERAPEUTICS OF THE MALE GENITO-URINARY TRACT.

By WILLIAM T. BELFIELD, M. D.

INFECTIONS OF THE GENITO-URINARY TRACT IN THE MALE.

The genito-urinary tract of the male may exhibit a primary infection by the following parasites:

1. The *gonococcus* of Neisser;
2. The as-yet-undiscovered *agent that induces syphilis;*
3. The *bacillus tuberculosis* of Koch;
4. The various bacterial species that cause suppuration—a dozen or more in number, collectively termed the *pyogenic bacteria* or *pus-microbes.*

To the gonococcus- and syphilis-infections all are apparently susceptible; freedom from either disease is secured only by avoiding the infecting agent. To the tubercle- and pus-infections, on the other hand, all are frequently exposed; hence freedom from these infections is secured not by avoiding the infecting agents (which is impossible), but by the natural resistance of healthy tissues. In other words—and this is the item of clinical importance—either tuberculosis or suppuration in the genito-urinary organs implies a pre-existing vice of nutrition. Cystitis, prostatitis, and pyelitis (non-gonorrhœal) are results—are secondary, not primary diseases.

GONOCOCCUS-INFECTION (GONORRHŒA).

The gonococcus of Neisser, usually reinforced by pus-bacteria as a mixed infection, is the agent in the induction of the severe urethritis known as typical gonorrhœa.

Beginning at the meatus, the extent of the surface invasion varies: in a minority of cases the infection invades only the penile urethra, ceasing at the triangular ligament; in the majority it extends, during the second or third week, through the membranous and prostatic urethra to the vesical orifice; in many it passes on through the ejacu-

latory duct to the seminal vesicle and the dilated extremity of the vas deferens (ampulla); and in 5 to 10 per cent. of cases the infection finally, in the third or fourth week, traverses the vas deferens to the epididymis.

Infection of the lymph-stream is usually arrested in the inguinal and pelvic lymph-glands, though frequently resulting in periurethral suppuration and sometimes in peritonitis. Infection of the blood-current takes place fortunately in only 2 or 3 per cent. of cases, usually as the so-called gonorrhœal rheumatism of fibrous and serous structures—joints, tendon-sheaths, bursæ, muscles; sometimes it attacks the endo- and pericardium or meninges—with fatal result.

The urinary channel proper, above its junction with the seminal canal, usually escapes, the infection ceasing at or about the vesico-urethral orifice; occasionally, however, it extends to trigone, ureter, renal pelvis, and even kidney-tubules.

The virulence of the gonococcus, as of other pathogenic bacteria, undoubtedly varies extremely, though evidence to this effect must for obvious reasons be clinical rather than experimental; such evidence consists of observations like the following: A girl of nineteen, married two weeks, to whose virginity at marriage the husband gave convincing testimony, was found to be the subject of a mild gonorrhœa. The husband had had the disease less than a year before his marriage, the discharge ceasing in about six weeks; it reappeared two days after his wedding. Numerous gonococci were found in the pus from the wife, a few in that from the husband. The girl was apparently well a month after marriage, having suffered no discomfort except from an inflamed inguinal gland; the discharge had been but slight.

The persistence of the gonococcus-infection likewise varies extremely. The writer cannot subscribe to the rather prevalent view which, promulgated a quarter of a century ago by Noeggerath, considers such infection practically permanent, either evident or "latent." It cannot be denied that the infection has been known to persist for years: G. E. Brewer reports an instance in which a man infected his bride six years after his own last attack, and Goll has found gonococci in cases two and three years after the infection. But, on the other hand, the complete disappearance of all evidences of infection, including gonococci, within three to six months has been often observed: the writer has assented to the marriage of a patient eight months after the disease began; and Goll failed to find gonococci in 80 per cent. of all cases examined even three months after the infection began. While, therefore, great caution should be exercised, repeated examinations of urinary threads made, and several months permitted to elapse after the apparent disappearance of the gonococcus before the resumption of sexual relations can be authorized by the

physician, yet each individual case must be decided on its own merits. The frequency with which married men who have contracted the infection resume conjugal relations even before the complete disappearance of the discharge, without apparent injury to their wives, supports the belief that gonorrhœa—in the clinical sense at least—does not usually retain great virulence for many weeks after apparent recovery.

The belief that the gonococcus-infection is a serious barrier to a man's future fertility is also contradicted by clinical observation. It is fair to assume that a large percentage of the fathers of the present day who spent their early manhood in cities have at some time contracted the infection. The writer has known a woman to become pregnant within four months of the beginning of the infection in her husband and herself.

What constitutes gonorrhœa? The confusion which reigned prior to Neisser's discovery of the gonococcus in 1879, as to the nature of purulent discharges from male and female genitals, was replaced a few years thereafter by the practice of regarding gonococcus-infection and purulent urethritis as synonymous terms. But further observations have proven beyond doubt that gonorrhœa in the clinical sense —that is, purulent urethritis acquired through sexual contact—is more comprehensive than gonococcus-infection; in other words, that the genitals of either sex are the habitat of certain bacteria other than the gonococcus (perhaps also of toxins) which may, when transferred through the sexual relation, occasion a purulent inflammation. And it is further established that purulent urethritis in the male—like purulent salpingitis, metritis, and vulvitis in the female—may occur when no specific bacteria are present and when no sexual contact whatever, according to the best evidence obtainable, has taken place. While it is doubtless true that in 90 per cent. of cases of purulent urethritis in the male the gonococcus-infection, acquired in the usual way, is the cause, yet it may be of vital importance in a particular case to remember the other 10 per cent. of cases which arise without gonococcus-infection, and some of which at least occur without sexual contact. It appears desirable that by general agreement the ancient term "gonorrhœa" should be now defined as "gonococcus-infection" rather than made to include all cases of purulent urethritis which are or are assumed to be acquired by sexual contact; and in this specific sense the word will be used in this article.

Non-gonorrhœal Urethritis.—Many accurately observed cases are now recorded in which the pus from a purulent urethritis following upon and apparently due to sexual contact has contained absolutely no gonococci. In some of these, various kinds of bacteria have been found—a diplococcus, a streptococcus, the colon bacillus; in certain

other instances no bacterial species was found in numbers sufficient to warrant a presumption of causal relation; and in at least one carefully observed case no bacteria whatever were discovered. In this instance a man, a few days after returning to his wife from a long absence, developed a profuse purulent urethritis, which was called gonorrhœa by his physician; the patient brought an action for divorce, alleging that his disease proved his wife's infidelity. Neisser himself examined the pus, and testified that it contained neither gonococci nor other bacteria.

Again, it has been shown that a diplococcus, indistinguishable by any laboratory test from the gonococcus, is occasionally found in small numbers in slight purulent discharges where sexual infection is at least very improbable. Whether this organism is a distinct species, a "pseudo-gonococcus," or whether it is the gonococcus exhibiting a wide range of virulence, are questions yet to be answered.

Finally, many cases of profuse purulent urethritis arise without infection of any sort from without. These are of two categories: first, cases of "auto-infection;" and second, cases in which the urethra becomes inflamed as the result of a local or general vice of nutrition.

Auto-infection of the anterior from the deep urethra, an exacerbation of an apparently cured but really uncured gonorrhœa, is exceedingly frequent; and because, following sexual indulgence, it is often considered a real gonorrhœa by patient and physican alike, auto-infection has given rise to many erroneous ideas as to both prognosis and treatment of gonorrhœa. The man who thinks he has had the disease a hundred times and can cure it in a few days, the physician who has a sure cure for gonorrhœa, are alike deceived; for they have failed to distinguish between a fresh gonorrhœal infection from without and an exacerbation of a chronic uncured gonorrhœa. This failure to differentiate between the two arises largely from the general neglect to distinguish *chronic gonorrhœa* from *gleet;* for these terms are usually considered synonymous, and the patient in whom the discharge from the meatus has ceased is considered cured. But the fact is that long after such free discharge has disappeared (showing the subsidence of the inflammation in the anterior urethra), the infection—that is, the gonococcus—may persist in some of the numerous follicles and glands of the posterior genital canal, especially the prostate and seminal vesicles. Sometimes this persistence is indicated by a gumming of the meatus in the morning; sometimes by the presence of pus-threads in the urine; in other cases only a diffuse purulent cloudiness of the urine betrays the infection; and in still other instances its persistence is not revealed until pressure upon the prostate and vesicles by the examiner's finger in the rectum forces pus into the urethra. Such cases of persistent gonorrhœal infection of prostate and vesicles, even without perceptible discharge from the meatus, may within

twenty-four hours after sexual indulgence be aggravated into a profuse purulent discharge—that is, an auto-infection of the anterior urethra. This is commonly considered a fresh gonorrhœa; and because it subsides within a few days (as it may under indifferent treatment) the particular injection or nostrum used during those days is credited with the cure of a gonorrhœa.

A patient of the writer's contracted gonorrhœa about four years ago and was apparently cured in two months; yet his first sexual indulgence thereafter was followed by (apparently) another attack. This discharge disappeared in a few days; yet almost every sexual act during four years thereafter was followed by a profuse purulent discharge, lasting from five to thirty days and considered by the patient a gonorrhœa. During this time he used numerous injections, submitted to division of an alleged stricture of large calibre, to a perineal section, and to electrical treatment of the deep urethra, and took quantities of various medicines. During his periods of continence, sometimes for months, there was neither gleet nor other sign of infection except a slight cloudiness of the urine (pus); but the renewal of sexual relations almost invariably entailed a purulent discharge, even when the use of a condom prevented fresh infection.

Pressure with the finger on the seminal vesicles and prostate caused the discharge from the meatus of thick, purulent fluid containing pus-microbes; and only after the vesicles and prostatic follicles had been repeatedly emptied by digital pressure from the rectum ("milking"), did the patient become able to indulge sexually without apparently contracting a gonorrhœa; in other words, the pus-infection which had so long been harbored in the deeper parts of the genital canal, and had so frequently infected the anterior urethra, was finally dislodged by mechanical means. When, therefore, a patient presents a profuse purulent urethritis following suspicious connection, it should be remembered that the infection of the urethra may have come not from the front but from the rear, particularly if the patient give a history of a previous infection.

Auto-infection of the anterior urethra independent of the gonococcus is observed especially in elderly men and in those of gouty tendencies; it is preceded by a chronic prostatitis and vesiculitis. A patient of the writer's, seventy-six years old, whose sexual activity had ceased years before, exhibited the clinical picture of gonorrhœa of several weeks' duration, which, however, promptly disappeared after "milking" of the engorged prostate and vesicles.

And finally, purulent urethritis is occasionally due to vices of nutrition, drugs, or local injury; thus a young man who suffered for the first time from a mild urethritis denied all exposure for several months previously; neither gonococci nor other cause for the disease

could be found until it was learned that the patient habitually drank a large quantity of ginger-ale daily; upon the discontinuance of this beverage (containing capsicum) the urethritis promptly ceased. In another case an undeveloped, sickly boy of twelve years had a severe urethritis which ceased without local treatment upon the removal of a stone from the bladder.

The differential diagnosis of urethral discharges requires, therefore, careful consideration of both clinical and microscopical evidence. They may be grouped in four classes:

1. *Gonococcus-infection from without*, marked clinically by an incubation of three to seven days (usually) and a severe inflammatory reaction; the microscope shows an abundance of gonococci contained in both pus and epithelial cells.

2. *Gonococcus-infection from within* (*auto-infection of the anterior from the deep urethra*), marked clinically by an incubation of six to twenty-four hours in a patient with a history of previous urethritis followed by a slight gleet, gumming of the meatus or pus-threads in the urine; the microscope may show gonococci, though in less numbers than in cases of the former class.

These two categories include over 90 per cent. of all cases of purulent urethritis in the male.

3. *Non-gonorrhœal infection from without*, beginning within two days after exposure, with slight inflammatory reaction; the microscope shows no gonococci but many pus-bacteria.

4. *Non-gonorrhœal infection from within;* this may be an extension to the anterior urethra of an inflammation in prostate and seminal vesicles in elderly men; it may follow injury by urethral instruments or caustic injections; or it may be due to undefined errors of nutrition. No gonococci are visible.

Treatment.

Efforts to mitigate the gonorrhœal inflammation have heretofore consisted of local applications (injections), and of the internal administration of substances like the balsams, which, being eliminated by the kidneys, irrigate the inflamed surfaces during urination. All such measures are at best but palliative; the anatomical reasons are alone sufficient to explain the futility of all surface medication. For the urethra is dotted with numerous lacunæ, half of them opening backward, into which no injection nor urinated fluid can be expected to enter; while Cowper's glands, the prostatic follicles, the utricle, and seminal vesicles, into all of which the infection may and often does extend, are evidently beyond the reach of urethral medication; moreover, the gonococci may penetrate the subepithelial tissue.

The rational treatment of gonorrhœa—the destruction of the in-

vading bacteria, or at least the inhibition of their growth—must evidently be accomplished by way of the blood-current; for this is the one medium by which the entire infected surface, its nooks and crannies, lacunæ and follicles included, can be reached. To this end the writer has for two years past administered internally certain agents which, whatever their mode of action, are known to materially enhance the resistance of the tissues to invasion by pyogenic bacteria: guaiacol, pilocarpine, nuclein, protonuclein, and thyroid substance. Each of these agents usually exhibits a decided effect in diminishing the purulent discharge of acute gonorrhœa, sometimes indeed changing it from pus to a glycerin-like fluid within forty-eight hours. Bacteriological examination of this fluid shows but few pus-microbes yet many gonococci; evidently these remedies, though very efficient against the pyogenic bacteria of the mixed infection, fail to materially inhibit the growth of the specific coccus. Nevertheless the abolition of the usual purulent discharge and the repression of the complications due to the pus-bacteria constitute a most gratifying advance in the treatment of this hitherto intractable disease.

Of the substances named the animal derivatives have seemed the most efficient: the thyroid-substance in 2-grain doses four times a day, or protonuclein in 3-grain doses six to eight times a day, usually secures a prompt result; the unpleasant effect sometimes produced by the thyroids upon the heart has led the writer to the more general use of protonuclein.

The treatment of anterior urethritis may be thus summarized: The patient should be instructed to scrupulously avoid constipation, bodily activity, alcohol, and sexual excitement, and to limit his indulgence in meats, coffee, and tobacco; he should destroy or sterilize by boiling any cloths or handkerchiefs soiled by the discharge and, to protect his own eyes, should wash his hands immediately after every contact with the infected parts or dressings; he should protect his linen, not by inserting cotton under the foreskin (because the pus is thereby retained in the urethra and spread over the glans), but by wearing a gonorrhœa-bag or similar article which, without compression of the penis, permits the escape of pus into the receptacle.

Medicinal treatment is internal and local; the former consists of laxatives, diuretics, and protonuclein as above mentioned; the local treatment consists of the free use of hot water for immersion and for injection, and of a saturated solution of hydrastine muriate to be injected four to six times per day. Injections of a 5 to 10 per cent. watery solution of argonin (a compound of silver with casein) are highly recommended by several careful observers; after considerable experience with this remedy the writer still prefers the hydrastine muriate. Injections should be made with a hard-rubber syringe

holding half an ounce and terminating in a blunt tip without nozzle; and it is wise for the physician to instruct the patient how to inject, both verbally and by administering an injection and by causing the patient to repeat the process in the doctor's presence.

Under such treatment the discharge becomes slight and watery within thirty-six hours; nevertheless the disease is not eradicated, and the treatment—at least the internal medication—must be continued for a month or more. It should be impressed upon the patient that the cessation of free discharge from the meatus does not prove that he has recovered; for long after this stoppage of the flow there may persist various evidences of disease, such as a gumming together of the meatus especially during the night, the appearance of a milky drop in the morning, and the constant presence in the urine of thick white threads of pus (*Tripper-fäden*), which soon sink to the bottom of the vessel. The persistence of any of these phenomena indicates the presence of one or more infected areas in the genital canal, and the case must be considered one of chronic gonorrhœa.

CHRONIC GONORRHŒA; GLEET.

It has been customary to consider chronic gonorrhœa and gleet synonymous terms—an erroneous conception, for by a gleet we understand a discharge from the meatus, while the gonorrhœal infection often persists in the prostatic urethra and seminal vesicles long after the anterior urethra is practically well and free discharge has ceased. Hence a chronic gonorrhœa may long exist without a gleet—an important clinical distinction. Gleet is the continuation of a discharge from the meatus and may vary from a profuse milky to a slight watery flow; during the day there may be no distinct discharge but only a gumming of the meatus; in the morning a drop or two of milky fluid can be expressed. While the discharge proceeds directly from the anterior urethra, its source may lie in the prostate or seminal vesicles; failure to recognize this fact is the explanation of many failures to stop the discharge: the patient uses one drug after another, one injection after another, with only temporary relief.

The first step toward the intelligent treatment of gleet is therefore the discovery of the infected area, which may be found anywhere from the meatus to the vas deferens. For practical diagnosis and treatment the possible sources of a gleety discharge may be divided into three groups: 1. Anterior urethra (to the bulbo-membranous junction); 2. Deep urethra (from bulb to bladder, including the membranous and prostatic urethra and utricle); and 3. Prostate, seminal vesicles, and ampullæ.

The simplest means for determining which of these three portions is the source of the gleet is called the "three-glass test," which is thus made: The patient, having retained his urine for two hours or more, submits to a thorough irrigation of the anterior urethra; he then passes about an ounce of urine into the first glass, whereby the pus is washed from the deep urethra; the physician's finger (enclosed in a rubber condom) is then introduced into the rectum and gently presses the prostate and seminal vesicles; the patient then passes another ounce of urine into the second vessel and the remainder into the third. A comparison of the amount of pus in the respective glasses affords a fair inference as to its source. It is chiefly important to know whether the pus-production is limited to the anterior urethra or extends also to the deep urethra; in the latter case some involvement of the prostate and seminal vesicles may be expected.

Digital examination *per rectum* should never be neglected in determining the source of a gleety discharge, even though the anterior urethra is found to be strictured or otherwise diseased; for the prostate and seminal vesicles are often the seat of persistent infection and contribute to or even originate the discharge.

Treatment of Chronic Gonorrhœa and Gleet.

The first step is a determination of the seat of the diseased area, as already outlined; a routine prescription of injections or use of sounds, while curing a certain number, will fail to relieve many that are amenable to intelligent treatment.

Certain general measures are applicable to all cases. They should carefully avoid constipation, alcohol, and the excessive use of tobacco and coffee. The special measures that may be required are—1. Sounds; 2. Injections, anterior and deep; 3. "Milking" of the prostate and seminal vesicles; 4. Medicines; and (occasionally) 5. Local applications to diseased patches through the endoscope.

1. Sounds.—A stricture should be treated by gradual dilatation carried to the full calibre of the urethra (No. 32 to 36 French). If a narrow meatus prevents the use of large sounds, the surgeon should choose between enlargement of the meatus (which is advisable in exceptional cases only, when the calibre is less than No. 20 French) and dilatation by means of special instruments, the dilators of Otis, Tuttle, and Oberländer.

2. Injections.—Of the multitude of injections recommended for gleet of the anterior urethra the following are useful: hot water (as hot as can be borne), alone, and containing in solution hydrastine muriate (saturated) or picric acid, zinc permanganate, nitrate of silver, 1 grain to 8 ounces.

Deep Injections.—Liquids injected from the meatus do not ordinarily reach the deep urethra because arrested by the so-called "cut-off" muscle, that is the membranous urethra; medication for the deep urethra is therefore usually made through a tube introduced beyond the bulb. Special syringes for this purpose have been designed by Guyon, Keyes, and others, whereby an exact number of minims of a given strong solution can be deposited in the deep urethra, a process often called "instillation." A better practice is irrigation of the deep urethra with a larger quantity of a weaker solution; for this purpose a small soft catheter (sterilized) is introduced until the urine flows, then withdrawn about an inch and a half; a five-ounce rubber syringe or small fountain syringe (hung low) is then attached. The solution passes from the catheter into the deep urethra and thence into the bladder, the cut-off muscle preventing its escape anteriorly; the catheter is then withdrawn and the patient empties the bladder, thus passing the solution a second time over the deep urethra. The solutions used may be nitrate of silver (1 part to 5000 of water) or bichloride of mercury (1 part to 10,000). Many patients can with practice inject the bladder without a catheter; liquids gently injected by means of an Ultzmann five-ounce syringe may, after slight delay at the cut-off muscle, flow into the bladder: elderly men are especially favorable subjects for this method.

3. Milking the prostate and seminal vesicles is always required when these parts are obviously diseased, and is sometimes useful even when no morbid condition is detected. This manipulation is thus performed: The physician's forefinger, enclosed in a rubber condom which should be anointed with glycerin, is gently introduced into the rectum, the patient either lying on the back or standing with body bent forward; the seminal vesicle being identified on one side of the rectum, the tip of the finger is drawn gently along it toward the prostate; this manœuvre is repeated six or eight times, after which the other vesicle can be, if necessary, similarly treated. The finger then being partly withdrawn, its tip is made to stroke the prostate toward the anus in a similar gentle manner; the prostatic utricle, which lies between the lateral lobes of the organ and is often distended with pus, should be included in this stroking process. During this manipulation and immediately afterward a purulent fluid may be discharged from the meatus. This milking process should always be performed with great care and gentleness; for the prostate, particularly when the subject of chronic inflammation, is exceedingly sensitive, and the operation at first very painful, often inducing faintness on the part of the patient (for this latter reason the recumbent is preferable to the standing posture for the patient). The process should not be repeated oftener than once in six or seven days; greater frequency or

undue pressure with the finger sometimes provokes an extension of the inflammation to the epididymis.

4. MEDICINES administered by the mouth cannot be relied upon to influence a gleet: some effect may be obtained from thyroid powder in 2- or 3-grain doses three times a day, or turpentine oil or tincture of cantharides in 3-drop doses. Iron and other tonics are beneficial to a patient showing signs of anæmia; mercury and iodine when syphilis is admitted or probable; guaiacol in tuberculous subjects; in malarial districts quinine may have a decided effect in checking gleet.

5. LOCAL APPLICATIONS to diseased areas through the urethroscope are sometimes necessary: the diseased surface is brought into the field, cleansed with cotton, and touched with a stick of copper sulphate, or a solution of silver nitrate or of chromic acid (5 to 20 per cent.), the application being repeated every few days as the course of events indicates.

SYPHILIS.

THE chancre occurs within the urethra more frequently than is generally stated; doubtless the slight purulent discharge which it occasions is usually mistaken for a mild gonorrhœa. The reprehensible but extensive practice of widely incising the meatus—so prevalent in the past few years in the search for strictures of large calibre—has doubtless favored urethral infection with syphilis as well as with gonorrhœa. The writer has seen urethral chancre followed by the usual constitutional symptoms in two brothers in each of whom the meatus had been widely divided.

Constitutional syphilis is seen in the urethra, penis, kidney, scrotum, and testicle. In the urethra it may cause a slight purulent discharge which is said to proceed from mucous patches similar to those commonly observed in the mouth; this has perhaps sometimes been treated locally and unsuccessfully as a gleet; it yields readily to internal treatment for syphilis. Every subject of an obstinate gleet should be interrogated as to previous syphilis.

In the penis gummata occur in the cavernous bodies, in the furrow between them, and in the glans; distinct nodules in these localities should always arouse a suspicion of syphilis and lead to specific treatment; an ulcerating gumma of the glans must not be mistaken for epithelioma.

There have been reported a few cases of gumma of the kidney simulating tuberculosis of that organ; in two such nephrectomy was

made, and the diagnosis corrected by examination of the specimen. The differential diagnosis must rest upon the absence of tubercle bacilli from the urine and upon the effects of syphilitic treatment.

In the scrotum syphilis often appears as broad condylomata, usually associated with similar growths at the anal margin or behind the corona glandis; their appearance is characteristic.

The testicle is frequently the seat of gummata which are liable to be mistaken for other neoplasms. The syphilitic testicle is smooth, globular, and painless—characteristics by which it is distinguished from most other enlargements. In general, every doubtful tumor of the testicle should be subjected to the internal administration of mercury and iodine as well as to mercurial inunction locally.

TUBERCULOSIS.

THE tubercle bacillus causes a frequent and clinically important primary infection of the genito-urinary organs, aside from the numerous cases of secondary infection of those organs from primary disease of the lungs.

By primary tuberculosis is meant the earliest perceptible tuberculous focus; it is probable that infection of the bronchial glands or other inaccessible parts usually precedes the appearance of the disease in the genito-urinary tract. Primary tuberculosis of these organs is usually first seen in the epididymis and the ejaculatory duct, less commonly in the kidney; but it rarely remains long limited to these organs, the prostate and seminal vesicle usually exhibiting the infection when the patient is first seen. While it must be admitted that the fœtus at birth may contain tubercle bacilli, yet opportunities for infection after birth are so numerous that post-natal infection seems the more plausible. It is probable that infection of the genito-urinary organs in the male is always by one route, the blood-current, whereby the bacilli are brought from old foci in the cervical and bronchial glands, in lungs, joints, or intestines; the idea that intercourse with a subject of tuberculosis of the pelvic organs can cause the ascent of tubercle bacilli along the male urethra to the prostate is fanciful and entirely devoid of proof.

The liability of the genito-urinary tract to active tuberculosis begins with puberty and is greatest during the succeeding ten or fifteen years; although tuberculous nodules have been demonstrated in the epididymis in children prior to puberty, and in the genital organs of elderly men, yet nearly all cases of genito-urinary tuberculosis first attract attention between the ages of fifteen and thirty

years. Yet since the disease rarely causes pain until the mucous surface of the prostate or bladder is invaded, it may exist for years in the other organs without compelling the patient to seek medical advice.

The lodgment and development of the tubercle bacilli are favored by that ill-defined vice of nutrition that we term hereditary predisposition, by injury, and possibly by gonorrhœal epididymitis; but it must be remembered that genito-urinary tuberculosis may be found in robust, athletic subjects in whose history none of these predisposing factors can be traced—a fact of clinical importance, because we are disposed to associate the idea of tuberculosis with marked cachexia.

The *symptoms* of genito-urinary tuberculosis vary with the site of the infection; in general it may be said that subjective symptoms are slight or absent until the mucous surface of the prostate is involved or until blocking of the ureter occurs. This usual absence of pain and vesical irritation accounts for the frequent failure to seek medical advice until the infection has become quite extensive. The primary focus is found usually in the epididymis, less frequently in the kidney. In the epididymis there can be detected hard nodules, at first small and slowly enlarging until by their coalescence much or all of the epididymis is converted into a hard, painless mass continuing into and finally involving the spermatic cord; the testicle remains long unaffected, but is finally transformed into a similar mass; sometimes one or more nodules soften at an early stage, the skin is perforated, and a persistent fistula remains. Soon after the infection is established in the epididymis it is transmitted to the seminal vesicle and prostate, in which organs the examining finger in the rectum detects distinct hard nodoles; extension to the mucous surface causes the symptoms of "cystitis"—pus in the urine and vesical irritability.

Renal tuberculosis may long exist without symptoms other than pyuria, although vesical irritation may occur early. Usually there are no symptoms directing attention to the lumbar region unless the ureter becomes blocked with pus or new tissue; then mild renal colic ensues. This absence of local symptoms is very deceptive; the writer once opened a tuberculous kidney to relieve renal colic due to obstruction; at the patient's death from uræmia ten days later, the opposite kidney—which had never given any symptoms whatever—was found to be a mere sac of tuberculous pus. In another case a patient suffered from severe cystitis with occasional slight renal colic; drainage of the affected kidney completely and immediately relieved the cystitis.

The presence in the pus of tubercle bacilli (which must be carefully distinguished from smegma bacilli) constitutes positive evidence of the nature of the disease; but failure to find them is so common

that the physician should depend largely upon the other diagnostic signs. Since tuberculosis seldom occurs in any of the genital or urinary organs of the male without soon involving the prostate, a digital examination *per rectum* is in the writer's experience the most important diagnostic measure. The cystoscope is useful in determining whether the pus depends from one or both kidneys as well as in discovering tuberculous lesions in the bladder; but it is essential to the diagnosis in comparatively few cases—fortunately, because the irritability of the bladder is usually so great as to render cystoscopic examination very unsatisfactory even with anæsthesia.

Treatment.

Experience has shown that the attempt to cure tuberculosis of the genito-urinary tract by surgery is rarely successful, simply because the aid of the surgeon is seldom sought until the infection has attacked numerous and inaccessible sites. While it is true that in exceptional cases the excision of a tuberculous testicle or kidney, even the resection of the bladder, has effected an apparent cure, yet in general surgical measures are useful merely in removing débris of tissue from the accessible parts—epididymis, testicle, and kidney; the surgery of this infection, at least in the urinary organs, should aim to be palliative, not radical.

Fortunately, medicinal measures are often successful in at least arresting, even in apparently curing, the disease. Such apparent cures are doubtless merely a repression of the infection, for actual extermination of the parasite probably never occurs; the tuberculous, like the syphilitic, infection seems by our present means incurable.

Dry air, sunshine, exercise, good food, and active excretion are exceedingly important; strychnine, arsenic, salicylic acid, and guaiacol are scarcely less necessary. The three drugs first named should be given internally in full doses; 15 minims of guaiacol, mixed with three times as much glycerin or olive oil, should be applied locally to the epididymis and cord, over the bladder or kidney, according to the part affected, two or three times daily; as repeated applications to the same spot cause tenderness and desquamation, the site should be changed daily. Under this treatment the writer has seen cases of extensive, almost hopeless, genito-urinary tuberculosis symptomatically cured without change of climate, and so remain for periods up to five years.

Extension of the infection to the mucous surface of the bladder-neck renders urination very frequent and exceedingly painful; in this condition nuclein solution, prepared by Vaughan's formula and injected into the bladder (1 drachm to the ounce of warm water) mitigates the vesical pain and tenesmus more effectually than do opiates.

PYOGENIC INFECTIONS (CYSTITIS, PYELITIS).

THE urinary channels are peculiarly exposed to the entrance of bacteria by way of the blood-current, the urethra, and the rectum. Yet it seems that septic infection of the normal urinary tract does not occur; in other words, that suppuration in this tract is preceded by some impairment of nutrition whereby the natural tissue-resistance is depressed. Many examinations have demonstrated that the normal urinary tract from kidney to prostate is absolutely sterile; and, though the normal urethral surface is known to harbor pus-bacteria, yet they fail to enter its tissues until these have been disturbed by some other agency. When this natural vitality of tissue is lowered by the stagnation of urine and venous congestion resulting from a tight stricture or prostatic enlargement, by the growth of the gonococcus, by a calculus or tumor, then the pus-bacteria—which easily gain access by one of the routes mentioned—may quickly infect a part or the whole of the urinary tract.

In cases of cystitis and pyelitis, therefore, a most important item of treatment is the discovery of the cause—that is, of the local failure of nutrition which renders the tissue unable to resist the pus-bacteria. This cause may be found as an obstruction to the exit of urine or foreign body in the bladder, or it may be a general vice of nutrition such as accompanies gout or spinal disease; sometimes the primary lesion is outside of the urinary tract—a seminal vesiculitis, an appendiceal or perirectal inflammation, etc. Whatever it be, a careful examination of the urinary and pelvic organs should precede the treatment of prostatitis, cystitis, or pyelitis.

TREATMENT.

The discovery and removal of the cause is the first and often the only necessity in treatment. If for any reason this cannot be done, treatment can only be empirical and palliative, and is often unsuccessful.

The vitality of the tissues is to be increased by hygienic measures, by careful attention to the excretory functions, and by strychnine and guaiacol internally; the so-called urinary antiseptics, especially salol and boric acid, may be given with large quantities of water, and the bladder irrigated daily with a weak solution of silver nitrate (1 : 5000), which the patient should expel after the catheter is withdrawn, thus bringing the solution in contact with the bladder-neck. The tincture of cantharides, 1 to 3 minims three times daily, is an empirical remedy often of great value in relieving vesical irritation, though it is impossible to predict in what cases it will succeed. The various preparations of nuclein in small doses materially aid the tissues in combating pus-bacteria.

LOCAL DISEASES OF THE MALE GENITO-URINARY TRACT.—URETHRAL DISEASES.

Strictures of the urethra are portions of the canal whose dilatability is less than normal; they have usually been classified as spasmodic and organic. While a "spasmodic" stricture—a narrowing of the channel due to spasmodic contraction of the muscular fibres encircling it—is doubtless possible, at least in the membranous portion, the obstruction often met at the bulbo-membranous junction and ascribed to spasm is frequently due to unskilful handling of the instrument: this is not made to follow the natural curve of the urethra and hence strikes against the firm triangular ligament just behind the bulb. The more skilful in catheterism the surgeon becomes, the less frequently he discovers "spasmodic" stricture.

Organic stricture—a diminution of the normal distensibility of this canal by an overgrowth of the submucous connective tissue—was formerly ascribed to either gonorrhœa or trauma; but it is now known that strictures exist, especially in the anterior half of the urethra, in men who have never had gonorrhœa; some of these at least are congenital and due to the incomplete absorption of the connective-tissue partition which in early fœtal life separates the penile from the glandular urethra.

Organic strictures may be present at any time of life, but are most frequently detected between the ages of twenty-five and forty-five. Strictures are far less troublesome in late than in middle life, possibly from the proneness of the cicatricial tissue composing them to undergo fatty degeneration.

The brilliant work of Otis in proving that the distensibility of the normal urethra is much greater (Nos. 30 to 35 of the French scale) than was formerly supposed, led to the attachment of undue importance to alleged "strictures of large calibre" and to a rather liberal practice of internal urethrotomy for their relief. Later experience has shown that the distensibility of the normal urethra varies greatly in different parts of this canal; that many of the so-called strictures of large calibre are normal structures; and that their division by the knife fails to cure many disorders that were formerly ascribed to them.

In every case of gleet or of disordered micturition, examination of the distensibility of the urethra should be made; indeed, such examinations should be a routine part of the investigation of almost every case of chronic urinary or genital disorder. Narrowing of the urethral canal may be detected by bulbous sounds when the meatus is sufficiently large to permit their introduction; when this orifice is abnormally small (less than No. 22 French) the physician should use a

specially constructed dilating bulb, the urethrometer, which can be introduced closed through the narrow meatus and expanded within the canal; division of the meatus is seldom justified. Bulbous sounds should not be introduced into the membranous urethra; this portion of the canal is explored by the ordinary conical sounds.

Treatment of Strictures.

The restoration of the urethral distensibility is the theoretical object of treatment; but it should be understood that by all methods heretofore employed such restoration is incomplete and transient; for while the symptoms can be abolished, yet an anatomical cure is probably unknown—recurrence of the contraction is to be expected. Hence a young patient with a stricture should be informed that even after apparent cure the contraction is apt to recur in a few years and need a repetition of the treatment; and that such recurrences will probably continue until he has passed the age of fifty-five years. There are two principal methods of treatment of urethral stricture—gradual dilatation and incision (urethrotomy). Gradual dilatation is the ideal treatment, successful in most cases of non-traumatic stricture; it often fails in two classes: 1. Traumatic strictures of the perineal urethra; and 2. Strictures of the glandular urethra—that is, within half an inch of the meatus. The value of gradual dilatation consists not in a direct spreading of the narrow portion, but in the fact that this stretching is followed by a decided congestion of the stretched portion, whose subsidence includes the absorption of some of the fibrous tissue constituting the stricture. The repetition of this process, not oftener than every three or four days, by the successive introduction of conical sounds of gradually increasing size, causes ultimately a more or less complete removal of the strictured tissue.

Urethrotomy, formerly much employed, is now generally reserved for cases in which dilatation is ineffectual because of the extreme hardness or extent of the stricture-tissue. Internal urethrotomy should be restricted to strictures within a half-inch of the meatus; elsewhere the operation is dangerous, the mortality being at least 2 per cent.; and there is great chance of severe hæmorrhage and of urinary infiltration, followed by local abscess, general septic infection, and such destruction of cavernous tissue as to induce, after recovery, a pronounced curvature of the penis when erect.

If an old stricture of the penile urethra be found undilatable, a combined operation—internal urethrotomy and external perineal urethrotomy—should be made; the urine is thus prevented from entering the wound in the penile urethra because drained out through the perineal tube, and the dangers of urinary infiltration are thus avoided.

Undilatable strictures of the membranous urethra should be treated only by external urethrotomy.

Electrolysis.—The effect of a negative current of 8 or 10 milliampères for ten minutes at intervals of three or four days has found some advocates: after much experience the writer considers this method much inferior to dilatation, except in cases of almost impermeable strictures, in which it has repeatedly rendered him valuable service.

Thiosinamin, $\frac{1}{4}$ to $\frac{1}{2}$ grain dissolved in water, three times daily, is a very valuable aid in the absorption of cicatricial tissue in the urethra as elsewhere: after over a year's experience with it the writer considers its use for several months an essential in the satisfactory treatment of hard strictures.

Tight and Impermeable Strictures.—Through the patient's neglect to seek assistance a stricture may so contract as to almost obliterate the urethral canal, permitting the passage of urine only in a very fine stream or even by drops, and causing distention of the bladder. If the subject of such a stricture becomes chilled, or indulges excessively in alcohol, he may suddenly find himself completely unable to void urine. Such strictures are usually amenable to gradual dilatation provided an instrument can be made to pass the narrow portion; this attempt should be made with "whip bougies," which are filiform for several inches of their length and then gradually increase in size to No. 12 or No. 15 of the French scale. When called upon to treat a stricture impermeable to ordinary bougies, especially if there be sudden and complete retention, the surgeon should apply hot water freely to the pelvic region, both externally by baths or fomentations and internally by rectal injections. Olive or castor oil is injected into the urethra and retained by closing the meatus; a whip bougie is gently introduced, the penis being drawn taut so as to obliterate transverse folds of the urethra; the filiform end is gently advanced to the stricture and the minute opening is sought. Sometimes success is immediate; more often repeated trials continued for many minutes are necessary; only gentle pressure should be made, since undue violence may result in puncturing the urethra (making a false passage) or in doubling the filiform end. If the instrument finally enters the stricture it should be passed on until its expanded portion has been forced into or through the stricture, thus enlarging the contracted part at once to a size which will permit the passage of a small bougie. The patient should be warned that the urinary stream may become very small a few hours later, and should be instructed to sit in hot water should he have difficulty in expelling his urine. If all efforts to pass the stricture fail, another attempt may be made on the following day; if the bladder be much

distended it should be relieved by suprapubic aspiration—a measure which frequently facilitates the subsequent passage of the stricture, because it favors the subsidence of urethral œdema. In exceptional cases repeated efforts having failed to open a passage through the urethra, the surgeon must open this canal through the perineum or enter it through a suprapubic cystotomy, in either case catheterizing the urethra from the rear. When the meatus is unduly small, strictures may be stretched by means of special instruments constructed on the umbrella principle and called urethral dilators.

The barbarous and dangerous method of rupturing a stricture, formerly in vogue under the name of "divulsion," should never under any circumstances be employed.

The treatment of stricture may be thus summarized: Gradual dilation is the preferred and usually successful method; internal urethrotomy is often necessary in tight strictures within half an inch of the meatus, and external urethrotomy in tight strictures, especially traumatic, of the membranous urethra; very tight strictures should be rapidly dilated by the whip bougie; intractable strictures of the penile urethra may require combined internal and perineal urethrotomy. The prolonged use of thiosinamin is a valuable adjuvant in promoting the absorption of stricture-tissue.

URINARY FEVER.

The use of instruments in the urethra and bladder, especially when these organs are inflamed, is often followed by chills and high fever—phenomena variously termed urethral, catheter, or urinary fever. These unpleasant symptoms most frequently follow lacerations of the mucous membrane, but can occur when no such laceration is apparent. The clinical course of urinary fever is variable: sometimes all morbid phenomena disappear in a day; sometimes they last for several days; and in some cases, especially in elderly patients, the fever assumes a typhoid aspect and continues until the patient's death some weeks later.

The term "urinary fever" designates several distinct morbid conditions. These are—

(1) Intoxication through lacerations of the mucous membrane with poisonous substances from the urine or from the mucous surface;

(2) Infection of the blood-current with septic bacteria through such laceration;

(3) Infection of the urinary channels—bladder, ureter, and kidney—with septic bacteria, constituting a suppurative cysto-pyelitis;

(4) Acute congestion of the entire urinary tract following the change in pressure caused by the sudden withdrawal of the urine in cases of chronically distended bladders; this condition is usually indicated by hæmaturia; and

(5) (Probably) a reflex nervous action.

The *avoidance* of urinary fever should be attempted by—

1. Gentleness of all instrumental manipulation, whereby the chance of lacerating the mucous membrane is diminished.

2. Careful irrigation, through a soft catheter, of urethra and bladder before metal instruments are introduced; and

3. In cases of chronically distended bladders, such as accompany prostatic enlargement and tight strictures, the physician should be careful, when called upon to introduce the catheter for acute retention or other cause, never to evacute the bladder completely at the first sitting; a portion only of the urine should be withdrawn, and the bladder gradually emptied by repeated catheterism during several days.

4. Urinary antiseptics, such as salol and boric acid, may be administered in 5-grain doses every four hours for a few days before and after urethral instrumentation. The value of such measures is problematic, and the surgeon should not place the least dependence upon the avoidance of infection thereby, nor be lulled into omitting any of the far more important local measures to the same end.

PROSTATE AND APPENDAGES.

THE prostate, its utricle, the seminal vesicles, and the dilated extremities of the vasa deferentia (called ampullæ) are, like the uterus and tubes of the female, enclosed in a thin fibro-muscular sheath which I have called the "broad ligament of the male." Infections and suppurative processes usually extend from the prostate to the seminal tubes and often to the enclosing fibrous sheath; hence we may, for brevity's sake, speak of the diseases which affect the prostate, utricle, and vesicles collectively as affections of the "prostate and appendages."

Acute inflammation of these organs is caused usually by the gonococcus-infection, occasionally by the internal administration of cantharides, capsicum, or other irritant, possibly by gout.

The chronic infections are gonorrhœal, tuberculous, and septic.

The chronic septic infections of the prostate and seminal tubes, when not gonorrhœal, are caused by urethral instrumentation, caustic urethral injections, by extension of a chronic urethritis due to tight

stricture of the deep urethra, by extension from a cystitis, by prostatic calculi, and by horseback and bicycle riding. They are favored by the chronic venous congestion of the pelvic organs which is so common in middle and advanced life as the result of constipation, alcohol-drinking, high living, lack of exercise, and excessive sexual indulgence.

The symptoms are dull pain in the suprapubic region, rectum, perineum, and sometimes in the glans penis, often aggravated by jolting or sitting on upholstered chairs; there is often pain in the sacral region (which the patient usually ascribes to his kidneys). Urination may be unduly frequent and be followed by the escape of a viscid grayish or watery fluid (from the prostatic glands) which the patient considers semen; sometimes there is a continuous slight discharge of similar fluid from the meatus—"prostatorrhœa;" sexual desire may be decreased and the normal sensation diminished or even absent; ejaculation may be premature and erection feeble; the patient is often extremely despondent. This is really the condition of incipient impotence, leading ultimately to loss of virility; indeed, until questioned, the patient may complain of the sexual symptoms only.

Examination with the forefinger (enclosed in a rubber condom) reveals a sensitive and swollen condition of the prostate or vesicles, or both; gentle milking of these parts causes the appearance at the meatus of considerable fluid.

The TREATMENT should begin with the removal of the cause of the trouble when this is practicable, such as the dilatation of a stricture. The local measures directed especially to the prostate and appendages have been already described in the discussion of Chronic Gonorrhœa. The despondency of the patient should not be ignored nor ridiculed; a cheerful prognosis and tonics are useful.

ENLARGEMENT (HYPERTROPHY) OF THE PROSTATE.

The frequent condition so called includes two anatomical states: 1. A diffuse enlargement of the prostate; and 2. Localized tumors of its glandular and muscular tissues, which project into the bladder. The diffuse enlargement is certainly often the result of the process just described—chronic inflammation of the prostate and vesicles; the local tumors may result from and accompany this inflammatory condition, or may arise as do tumor-formations in general. They are found in many cases of enlarged prostate, though their presence cannot usually be recognized until the bladder is opened, because they grow into the vesical cavity and cause no change in the rectal surface of the gland, which alone is accessible to the examining finger; they can sometimes be seen through the cystoscope.

Prostatic enlargement is a disease of the second half of life; it often begins before the patient becomes fifty years old, but does not

usually cause him to seek a physician's advice until several years have elapsed; indeed, the derangement of the urinary function is so gradual that the patient often ignores it until some pronounced symptom of advanced disease, such as complete retention of urine, startles him.

A patient over forty-five years of age who complains of any urinary derangement should be examined *per rectum;* undue size of the prostate should lead to the passage of a clean soft catheter immediately after urination; a flow of residual urine (which should be stopped at a few ounces) shows that the voluntary evacuation of the bladder is incomplete and that the familiar train of distressing phenomena incident to advanced prostatic disease threatens the patient.

The examiner must now exclude other morbid conditions which may give rise to the symptoms of cystitis, prominent among which are vesical calculus, tumor, tuberculosis, and prostatic cancer. Calculus can generally be recognized by the sound, tumor by the cystoscope, tuberculosis by the nodular thickening in the seminal vesicles, prostate, and epididymis; and prostatic cancer by the uneven, nodular hardness of the prostate, the enlargement of inguinal lymph-glands, hæmaturia, and emaciation of the patient. It should be remembered that the chronic retention of urine resulting from prostatic enlargement favors the formation of vesical calculus, which is an exceedingly common—and often overlooked—sequence of this condition.

Treatment of Prostatic Enlargement.

The treatment is general and local; personal hygiene, including good digestion, regular and easy defæcation, warm clothing, exercise, avoidance of cold and of excesses in eating and drinking, is very important; the patient should drink three pints or more of pure water daily; in cases where marked hardness of the prostate indicates fibrous tissue, thiosinamin—half a grain in water after each meal, continued for weeks—is a valuable remedy.

Local treatment endeavors to reduce the congestion and œdema of the prostate; to promote evacuation of the bladder; and to prevent or arrest septic infection of the urinary passages. To this end there are three principal means—the milking of the prostate and vesicles by the finger in the rectum, previously described; the free use of hot water as baths, irrigations of the bladder, and rectal enemata; and the passage of a large sound once a week If septic infection of the bladder-neck, shown by pus in the urine, already exist, the prostate and bladder should be irrigated with a weak solution of silver nitrate (1 : 5000) or of sodium chlorate (1 : 100) twice a week.

In the later stages the patient must be taught to evacuate the

residual urine by a catheter once or twice daily. The soft Nélaton catheter will usually enter the bladder; if it fail, the stiffer *coudé* instrument of Mercier, commonly called the prostatic catheter, generally succeeds; metallic instruments and those armed with a stylet easily lacerate the urethra and are seldom needed. All instruments used in prostatic cases should be scrupuously clean; they can be made and kept so by immersion in a 2 per cent. solution of formalin.

It is highly important that the prostatic urethra as well as the bladder should be washed by the irrigating fluid; this is accomplished by withdrawing the catheter until the eye has receded one or two inches from the bladder before the fluid is injected; after the injection the catheter can be pushed back until the outward flow begins. Many of these patients readily learn to inject the bladder from the meatus without using a catheter—a method sometimes advantageous.

Internal medication has hitherto proven of little benefit in these cases; but the writer can recommend the continued use of sodium salicylate, 10 grains three times daily, and of thiosinamin, $\frac{1}{4}$ to $\frac{1}{2}$ grain three times a day, as serviceable; the latter remedy has an undoubted influence in diminishing the fibrous tissue always present in greater or less degree.

In advanced cases certain complications arise which may render surgical interference inevitable; these are complete retention, persistent cystitis of great severity, and such distortion or stenosis of the prostatic urethra as renders catheterism very difficult or painful.

Complete retention is a serious event; when called to such a case the physician should observe three rules of great importance: 1. Never to use force nor lacerate the urethra—that is, to use only flexible instruments; 2. To observe strict aseptic precautions as to instruments and urinary channel; and 3. Never to empty the bladder completely at the first catheterism.

The patient suffering from complete retention should have a hot water enema, followed by a $\frac{1}{4}$-grain morphine suppository; a hot hip-bath or fomentation should be used for a quarter or half an hour, the patient then warmly covered in bed, the hips being elevated above the shoulders. The anterior urethra is irrigated with hot water injected with warm, clean oil; a clean soft catheter, No. 10 or 12 English scale, is filled with the oil and introduced, the penis being drawn firmly forward; steady pressure often forces the instrument into the bladder; if this effort fail an elastic prostatic (Mercier) catheter should be tried; if no false passage exists this instrument can always be made to pass the prostatic obstruction without injury. If, however, the urethra is already lacerated by the previous use of metal instruments the difficulties of catheterism are enormously increased; even then the Mercier instrument is to be preferred,

though occasionally a metal catheter of large diameter and long curve may be used; but force must be scrupulously avoided, for no one can know the direction of the distorted and swollen prostatic urethra, and forcible catheterism results only in false passages, profuse hæmorrhage, and a trying situation.

In cases which have been thus forcibly handled, suprapubic aspiration is sometimes inevitable; the needle should be entered at right angles with the spine about an inch above the upper border of the symphysis, half of the estimated contents of the bladder withdrawn, hot fomentations again applied, and the patient kept in bed for some hours; the relief of bladder-tension and the reduction of prostatic œdema thus secured may result in easy catheterism at the next attempt, or even in voluntary urination; but should retention persist and catheterism remain impossible, aspiration must be superseded by one of the methods of operative relief.

Should the physician succeed in introducing the catheter, he should not at once evacuate the bladder completely: sufficient urine should be withdrawn to give the patient complete relief, and an ounce or two of some antiseptic solution injected; in the course of a few days the bladder may be thus gradually emptied. Even with the greatest care some fever usually follows complete retention requiring the use of the catheter, yet the ill effects are minimized by the measures described. Persistent cystitis of high grade, and difficult catheterism from prostatic distortion, must often be relieved by surgical measures.

Operative Treatment.—Surgical treatment comprises three operations: Drainage of the bladder, prostatectomy, and castration.

1. *Drainage of the bladder*, by either perineal urethrotomy, suprapubic cystotomy, or a combination of the two, is the simplest, safest, and surest method of temporary relief; the suprapubic is superior to the perineal incision because of the greater command of the bladder-cavity afforded by it. Drainage of the bladder may be temporary or permanent; in many cases the cystitis and inflammatory swelling entirely subside in two or three weeks, after which the tube may be removed and the wound permitted to heal; the patient may then enjoy years of freedom from urinary discomfort. In other cases where the prostatic enlargement and distortion are found to be so great as to render a speedy return of the urinary difficulties probable, the artificial opening may be made permanent by having the patient wear constantly a rubber or silver tube, which is removed daily for cleansing. The permanent fistula has, however, fallen into disfavor, having been supplanted by the following operations:

2. *Prostatectomy*—the removal through combined suprapubic and perineal incisions of projecting outgrowths of the prostate and the restoration of a low-level channel from bladder to urethra—has

become a standard operation. The prostatic tumors, when pedicled, are removed by scissors, snare, or cautery; when imbedded in the prostate they are enucleated through either the suprapubic or perineal opening: large masses of prostatic tissue can thus be removed with surprisingly small damage to the mucous lining of the bladder. The hæmorrhage is usually slight and easily controlled by hot water and packing with iodoform gauze; the prostate is thoroughly stretched by the finger, and any bar at the vesical orifice freely incised. The mortality of this operation, at first 25 per cent., is now in skilful hands reduced about one-half; the results range from a complete restoration of the urinary function on the one hand to merely an increased facility of catheterism on the other; the prognosis varies, of course, with the patient's general condition as well as with the previous duration of bladder atony.

3. *Castration*, the removal of both testicles—a plan suggested by the frequent atrophy of uterine fibroids after the removal of both ovaries—has been extensively practised during the last four years for the relief of sufferers from prostatic hypertrophy. In a considerable percentage of the cases already reported great relief from cystitis has been secured, and in some the power of voluntary urination has returned; in a smaller number more or less complete failure to secure any benefit whatever has been the result; in some instances double castration has been recommended and even performed in cases where an undiscovered stone was subsequently found to be the cause of the trouble; for it is sometimes impossible to detect by the sound a calculus hidden in a pocket of the bladder.

This operation, the mortality from which rivals that from prostatectomy, has been most frequently successful in cases where the prostatic enlargement was soft and inflammatory rather than hard and fibrous—that is, in cases of the same sort as are relieved by simple drainage of the bladder. The unquestioned fact that a vesical calculus, tumor, or tuberculosis may escape detection by an expert surgeon renders it apparent that double castration should be performed only after a digital exploration of the bladder has been made; and the drainage following such exploration will often accomplish all that could be hoped for from castration.

Ligature of both vasa deferentia has been found to afford much relief in some cases of prostatic hypertrophy; since it is a relatively slight (although not absolutely safe) operation, free from the æsthetic objections to double castration, it may be substituted for the latter as a purely tentative procedure.

To summarize: When surgical interference becomes necessary it should consist in temporary drainage of the bladder with stretching of the prostatic urethra; if this exploration reveals such distortion

and overgrowth of the prostate as renders a cure by simple drainage improbable, the surgeon must be prepared to make either a prostatectomy, a ligation of both vasa deferentia, a double castration, or a permanent fistula—according to the condition and previously ascertained preference of the patient.

Cancer of the Prostate.

Cancer of the prostate, including carcinoma and sarcoma, is a not infrequent disease, occurring chiefly in patients under ten and over fifty years of age; while most of these tumors are found on histological examination to be carcinoma, the clinical distinction is often impossible and always unimportant.

The symptoms of primary prostatic cancer are hæmaturia, pain, and cystitis; the bleeding occurs without apparent provocation and is intermittent; pain is felt in the rectum, perineum, and thighs, especially after urination; cystitis may be long delayed. The diagnosis is in the early stages difficult, cancer being often indistinguishable from the more frequent hypertrophy of the prostate; the most important and constant diagnostic signs are progressive emaciation and pallor; hard enlargement of lymph-glands in the groins, pelvis, and Scarpa's triangle; and irregular nodular enlargement of the prostate. Cancer is often grafted upon senile hypertrophy; the discovery of recognizable cancer-tissue in the urine, or the detection of a malignant ulcer through the cystoscope, is conclusive evidence. In elderly men the disease lasts several years; in children death ensues in a few months.

The treatment of prostatic cancer is only palliative; for, although the cancerous prostate has been extirpated several times, the patients who survived the operation have all died of recurrence within a few months. Pain may be mitigated by morphine; cystitis, hæmorrhage, and urinary retention treated symptomatically; and when other measures fail to relieve the vesical distress a permanent suprapubic exit for the urine may be made by puncture with a trocar, through whose canula a soft rubber catheter is introduced.

DISEASES OF THE BLADDER.

Cystitis.

Cystitis is a bacterial infection of the bladder; the pyogenic bacteria (especially the colon bacillus), the tubercle bacillus, and the gonococcus are the species concerned.

Pyogenic bacteria are incapable of infecting a normal bladder—a

statement proven by experiment and illustrated by the frequent harmless introduction of unclean catheters and sounds. When, however, the nutrition of the bladder is impaired, as by a calculus, prostatic enlargement, or deep urethral stricture, the pus-microbes—gaining easy access from rectum, urethra, and blood-current—infect its walls, producing the inflammatory reaction which we call cystitis. Hence this disease, when neither tuberculous nor gonorrhœal, is a secondary, not a primary, morbid condition.

The classical symptoms of cystitis—frequency and pain in urination and pyuria—really indicate inflammation of the prostatic urethra rather than of the bladder; but they may be caused by an irritation of the renal pelvis, such as stone or tuberculosis, and by seminal vesiculitis; they should therefore not be considered to warrant a diagnosis of cystitis; in fact, the differential diagnosis as to the cause of these symptoms is sometimes impossible without the cystoscope.

The TREATMENT of cystitis endeavors to discover first the location and second the cause of the morbid condition producing the symptoms: the site of the lesion may be the bladder, the prostatic urethra, the renal pelvis, the seminal vesicles; the antecedent morbid condition may be gonorrhœa, a tight stricture of the deep urethra, prostatic enlargement, stone or tumor in the bladder or prostate, tuberculosis of the genital organs, or perirectal abscess. Since these conditions require widely different treatment, it is evident that there is no treatment applicable to cystitis in general beyond the removal of the cause. When this is impossible the patient's suffering may be diminished by the internal administration of demulcents—buchu, hamamelis, etc.; by washing the deep urethra and bladder with hot water containing silver nitrate (1 : 5000), sodium chlorate (1 : 200), or by the injection into the bladder of liquid vaseline; lesions of the spinal cord and constitutional conditions such as gout and lithiasis must not be overlooked.

TUMORS OF THE BLADDER.

These may be divided into three classes: papilloma, fibroma, and cancer; they occur oftener in males than in females, and mostly in the second half of life. They usually give rise, at some stage of their growth, to three symptoms—hæmorrhage, pain, and cystitis. Bleeding from a tumor is often distinguished by three features: its occurrence independently of exercise, indeed frequently during sleep; its abundance, perhaps filling the bladder with clots; and its increasing frequency. The pain of a vesical tumor accompanies malignant rather than benignant growths, and tumors of the trigonum rather than those more remotely situated; cystitis is a common though often a late result of a bladder tumor.

There are but two positive diagnostic signs whereby a vesical tumor is distinguished from calculus and tuberculosis—the appearance in the urine of fragments of the growth, and ocular detection by the cystoscope. The degree of malignancy of the growth is likewise often problematical: a tumor in a young patient, causing much bleeding and no pain, is generally a benignant papilloma; a tumor in an old person, causing severe and radiating pains, is usually malignant; between these two extremes are many cases in which the degree of malignancy can only be conjectured, even when fragments are found in the urine or caught in the eye of a catheter; transformation from benignancy to malignancy certainly occurs in some bladder tumors; operative removal, when incomplete, seems to hasten this change.

In every case of obscure bladder disease the interior of the organ should be inspected through the cystoscope. Tumors will usually be found at or near the trigonum; papillomata can be easily recognized as slender, warty growths, similar to the pointed condylomata of the external genitals; fibromata are less easily distinguished from the folds of mucous membrane; cancerous growths are usually sessile tumors, whose surfaces may be ragged, ulcerated, or papillomatous; this latter feature has led to confusion of the malignant tumors with the benignant papillomata. The distinction between them exists in the base rather than in the surface of the growth; though the color of this surface is often distinctive, the benignant tumors being pink and the malignant gray.

Treatment is palliative and radical. The bleeding may be controlled by the internal administration of turpentine oil, 3 to 5 drops on sugar or in emulsion three to five times daily, and by injecting into the bladder a 1 per cent. solution of sodium or potassium chlorate; pain is controlled by morphine, and cystitis by the treatment already suggested. In favorable cases (as determined by the cystoscope), the tumor may be excised through a suprapubic cystotomy; the results of such excision have been often favorable for benignant, but unsatisfactory for malignant growths, for in the latter class the complete removal of the dense base is often impossible even with resection of the bladder-wall; and incomplete removal seems to accelerate the malignant infiltration.

In general, vesical growths which have infiltrated the bladder-wall, as revealed by the finger in the rectum or after excision in the bladder, are not suitable for radical operation; those, on the other hand, whose bases are normal tissue, can be removed with a fair prospect of cure, or at least of long freedom from recurrence. Even in cases of cancer a suprapubic incision may be needed for the arrest of hæmorrhage or for the relief of cystitis by the establishment of a permanent fistula.

KIDNEY, PELVIS, AND URETER.

THE upper urinary passages are subject to three bacterial invasions—gonorrhœal, septic, and tuberculous; and to the formation of calculi and tumors.

PUS-INFECTION; PYELITIS (SURGICAL KIDNEY).

The various pyogenic infections are sequels of gonorrhœa, chronic septic infection of the bladder (chronic cystitis) such as results from prostatic enlargement, vesical calculus, and tight stricture of the deep urethra; they may also result from catheterism in the puerperal state. Less frequently septic infection of the kidney and its pelvis comes from the blood-current, as a complication of general infections, such as typhoid fever, diphtheria, etc.

Acute pus-infection of the upper urinary passages is marked by chills, fever, pain over the kidney and along the course of the ureter, down the thigh and in the corresponding testicle, which may be retracted; it is, however, more often a chronic disease, and is then a gradual process whose symptoms may be masked by the more prominent signs of coexistent cystitis.

TREATMENT aims to arrest the cystitis of which the pyelitis is often the extension, by the careful dilatation of a urethral stricture, the removal of a vesical calculus, etc. In cases of severe cystitis and pyelitis from prostatic enlargement, simple drainage of the bladder for a few weeks may be followed by a cessation of the inflammation in the upper urinary channel. The internal administration of nucleinic acid and of sodium salicylate, and the external application of guaiacol in full medicinal doses are important adjuncts in treatment. In women the ureter can be catheterized and irrigation of the ureter and kidney-pelvis made with hot water containing hydrastine muriate (saturated solution) or other local antiseptic.

The differential diagnosis between pus-infection, tuberculosis, and calculus of the renal pelvis often taxes our present means of diagnosis. In every case of pyelitis the physician should make a microscopic examination of the urine, noting pus, blood, crystals, and bacteria; then with the cystoscope it can be seen from which ureter the pus issues; and from the conspectus of symptoms a diagnosis of greater or less certainty is made. Yet, after most careful and thorough examination and confident diagnosis, competent surgeons have opened the kidney and found their conclusions erroneous.

MOVABLE AND FLOATING KIDNEY.

Abnormal mobility of the kidney is congenital or acquired; the movement may take place behind the peritoneum (from laxity of the

renal attachment) or within the abdominal cavity (from the enclosure of the kidney in a distinct envelope of peritoneum, a mesonephron). The former, the movable kidney, is far more frequent than the latter, the floating kidney; although this anatomical distinction is not often clinically practicable until the kidney is exposed. Movable kidney is found usually in women, especially in those who have borne several children; but it is not rare in men.

The symptoms vary from almost nothing to a degree of pain that incapacitates the patient for active bodily movement—a dragging sensation in the abdomen which may be aggravated by movement, standing, constipation, or menstruation into a sharp pain resembling renal colic, and perhaps accompanied with nausea. Upon palpation with the patient in various positions a tumor can usually be discovered corresponding in size and shape with the normal kidney, located anywhere in the abdomen or pelvis, and generally capable of reposition in the normal locality when the patient's hips are elevated.

The treatment endeavors to retain the kidney in its normal position, either by a truss (which often fails, especially in fleshy patients) or by nephrorrhaphy (nephropexy).

TESTICLE AND EPIDIDYMIS.

ACUTE inflammation of these organs is due to gonorrhœa, septic infection, trauma, or the general infection of mumps, typhoid fever, or other acute bacterial diseases. The essentials of local treatment are hot fomentations, the application of guaiacol (15 minims, dissolved in three times that quantity of glycerin), three times daily, and the thorough suspension of the inflamed organ against the symphysis, by means of a jockey-strap or similar bandage enclosing cotton and oiled silk, next the skin.

The chronic diseases are all accompanied by enlargement of these parts, and the differential diagnosis is therefore a comparative study of these enlargements.

TUBERCULOSIS usually begins in the epididymis as hard, nodular swellings like shot, later coalescing into a cord; the tuberculous tissue may become adherent to the skin, soften and ulcerate, making an obstinate sinus. Digital examination *per rectum* usually shows a similar condition of the seminal vesicles and prostate.

SYPHILIS on the other hand usually attacks first the testicle, making a smooth, painless enlargement and not involving the prostate.

CYSTIC DISEASE is a slow-growing, painless tumor, the fluid nature of which can be established by the aspirating needle.

CHRONIC EPIDIDYMITIS and orchitis may cause great enlargement of these organs, which are usually painful and sensitive to pressure; abscess and cyst-formation may occur.

CANCER of the testicle (carcinoma and sarcoma) is most frequent in the second half of life, and can sometimes be distinctly traced to a blow. In the early and slow stages there may be no positively distinctive feature from the cystic and inflammatory enlargement, but the active stage is marked by rapid growth, constant pain, induration of the inguinal and pelvic lymph-glands, and finally emaciation and cachexia.

The treatment of these several conditions has been previously suggested.

DISORDERS OF INSEMINATION.

THE function of the male in reproduction is the deposit of motile spermatozoa on the cervix—insemination. Defects in this function are called impotence and sterility, the former implying inability to copulate, the latter (when not caused by impotence) the absence of moving spermatozoa from the semen.

IMPOTENCE AND STERILITY.

Impotence.—When not resulting from malformation, inability on the part of the male to copulate is caused by either imperfect erection or premature ejaculation. Normal erection consists in the distention of the cavernous and spongy bodies with blood, which is brought about by the dilatation of the penile arteries and the constriction of the venous exits; and this in turn results from the contraction of the perineal and penile muscles stimulated through branches of the second sacral nerve from the genital centre in the lumbar cord. This centre responds to stimulation from either the brain or the nerve-endings distributed in the penis from prostate to glans; hence erection may be induced through excitement of this centre by sexual thoughts, or by influences from the periphery such as friction of the glans, congestion of the prostatic urethra by a distended bladder (morning erections), etc.; the genital centre may also be directly stimulated by certain drugs taken into the blood such as cantharides and alcohol. Ejaculation of semen is accomplished by the same apparatus stimulated to a higher degree, resulting in a contraction of the genital muscles, which begin in the fibres of the broad ligament, and continues through the prostate and perineal compressors.

Feebleness or absence of erection may therefore be caused by any one of the following factors: 1. Depression of the genital centre by the brain, from fear, grief, anxiety, disgust; 2. Depression of the

genital centre through imperfect nutrition, as in diabetes mellitus; 3. Diseases of the spinal cord, such as ataxia and myelitis; 4. Exhaustion of the genital centre by excessive sexual activity, whether in intercourse or masturbation; 5. Disease of the nerve-endings in the genital tract, especially the prostatic urethra, caused by inflammation —the commonest form of impotence. This chronic inflammation of the prostate results usually from gonorrhœa or from sexual excess.

The subject of this form of impotence often complains of pain in the sacrum, suprapubic region, perineum, and testicles; anxiety and despondency are marked features. A diagnosis can be made by a digital examination of testicles, prostate, and seminal vesicles; gentle pressure ("milking") of the latter organ often causes the appearance of a milky fluid at the meatus.

The TREATMENT of impotence will naturally be determined by the cause; excluding cases of diabetes, spinal-cord disease, etc., the treatment is mental and local. The false and terrifying ideas which the patient has probably derived from the perusal of quack literature should be corrected and a cheerful prognosis given. The local treatment is that for chronic inflammation of the prostate and appendages already described—milking of these organs, deep injections of weak silver-nitrate solution, alternating hot and cold sponging of the perineum and external genitals, and pills of camphor monobromate; strict limitation of sexual excitement, mental and physical diversion and hygiene are important. The prognosis varies with the age of the patient and the cause of the impotence; the most favorable cases are those due to gonorrhœa in the young. Direct stimulation of the sexual organs by drugs should be avoided, though strychnine, arsenic, iron, and phosphates may improve the general condition.

Sterility.—Failure to fertilize the female may be due either to inability to deposit the seminal fluid in the cervix (impotence) or to the absence of moving spermatozoa from that fluid (sterility proper); the latter may exist when the power of copulation is unimpaired. In these cases no spermatozoa whatever are found in the semen (azoospermia), or the spermatozoa emitted are nearly or quite motionless; this absence of motion, entailing sterility, may be due to a chronic inflammation in some part of the seminal tubes, especially prostate and vesicles.

The TREATMENT of sterility depends upon the cause: if the freshly passed semen, received in a condom, contains no spermatozoa, treatment is useless unless a double epididymitis exist, in which case daily massage of the indurated tissues with mercurial ointment should be made for several weeks. If spermatozoa be present, though lacking motility, the usual treatment for chronic inflammation of prostate and vesicles should be made.

Involuntary Seminal Discharges.

These occur in two ways : 1. *Nocturnal emissions* ; 2. *Spermatorrhœa.*

Seminal emissions with the natural orgasm, occurring during sleep and with an erotic dream, are experienced by healthy, continent men at intervals of ten to thirty days ; when not followed by languor or sacral pain they may be considered compatible with health. Emissions occurring at short intervals and followed by lassitude and pelvic pains commonly arise from abnormal excitement of the genital tract, such as follows habitual masturbation, sexual excitement without gratification, or the extension of a gonorrhœal infection to the prostate and vesicles. Treatment should include instruction in the hygiene of the sexual organs, especially the avoidance of ungratified sexual excitement in every form and sexual excess. Monobromate of camphor, two grains night and morning, will usually lengthen the intervals between nocturnal emissions by decreasing the excitability of the genital centre in the cord ; if congestion of the prostate and vesicles exist it should be reduced by the passage of large cold sounds, the hot and cold perineal douche, deep injections of silver nitrate solution, milking of the parts, etc.

Spermatorrhœa should mean the involuntary escape of seminal fluid without orgasm ; while it may occur under sexual excitement, it is usually observed merely at the close of defæcation or urination. Under the latter circumstances the fluid pressed out at the meatus, though resembling semen, often contains no spermatozoa, being in fact merely prostatic secretion ; and the condition should be called *prostatorrhœa.* Yet, whether it contain spermatozoa or not, the habitual appearance of this fluid indicates a chronic inflammation of the genital organs, which should be treated by the measures already recommended for that condition.

GENERAL NOTES.

Diagnostic Notes.

Pain.—Pain in the urethra, especially in the fossa, is a common symptom of inflammatory affections of the prostate ; pain in the sacral and suprapubic regions often accompanies chronic inflammation of prostate and vesicles ; these latter conditions may also cause pain referred by the patient so distinctly to the rectum that he assumes the existence of disease in the bowel. Pain in the lumbar region, extending along the ureter to the testicle, indicates an irritation of the kidney-substance or of the renal pelvis; and may be caused by a calculus, tuberculosis, or partial obstruction of the ureter (from stricture or kinking).

Pyuria.—The detection of the source of pus in the urine—an accompaniment of many diseases of these organs—sometimes taxes the physician's diagnostic power; for, aside from the anterior urethra, any part of the urinary channel and either of the seminal vesicles may be the origin of the pus which is present in the urine. In a general way the three-glass test, already described, may indicate the source; but the specific site and cause of the suppuration may require a careful weighing of all symptoms and even inspection of the bladder and ureteral orifices through the cystoscope. No inferences can be properly drawn from the gross appearances of the pus nor of the accompanying epithelium, unless this be the atypical fragment of a malignant tumor.

Hæmaturia.—The source of blood mixed with urine can usually be detected with reasonable certainty; in general it proceeds from either prostate, bladder, or kidney. Bleeding from the prostate usually arises from conditions, such as cancer and tuberculosis, which are recognizable by the finger in the rectum; bleeding from the kidney is often symptomless, while hæmorrhage from the bladder often proceeds from morbid conditions that are preceded or accompanied by great vesical irritability. Yet in many cases positive knowledge as to the source of hæmaturia must be obtained through the cystoscope, whereby not only the vesical cavity but also the orifices of the ureters can be inspected.

Albuminuria.—Albumin may appear in the urine independently of nephritis in any condition which causes frequent spasmodic contractions of the bladder, such as acute prostatitis, tuberculosis, or tumor near the vesical orifice. The escape of albumin from the renal vessels seems to result from the increased pressure in the tubules resulting from undue contraction of the lower end of the ureters. With the subsidence of the vesical irritation albumin disappears from the urine.

Vesical Irritation.—Frequent and more or less painful urination indicates really an irritation of the prostatic urethra rather than of the bladder; it may be due to a morbid condition which does not involve the bladder, but is located at any point of the urinary channel from meatus to renal pelvis, or even in the seminal vesicle; at times, too, it may result from the presence of acrid substances in the urine without local disease of the urinary passages. It is a frequent symptom of tuberculosis of the renal pelvis, of stricture of the ureter, and of seminal vesiculitis.

Fever.—The thermometer should be used as a routine part of urinary diagnosis: an irregular temperature may be an important factor in distinguishing between various conditions, such as the tuberculous and the septic infections of inaccessible parts like the kidney.

Digital Examination per Rectum.

This is essential in the case of every patient seeking relief from disease of the urinary or genital organs; it reveals important morbid conditions of prostate and vesicles, and materially assists the exploration of the bladder by a sound. The disagreeable features of such examination are largely obviated by enclosing the finger in a rubber condom, which is then anointed with glycerin (rubber dissolves in fats).

The Cystoscope.

The electric cystoscope of Nitze or Leiter, or one of the later modifications of this instrument, is a most valuable, sometimes essential, means of diagnosis. Some diseased conditions can be detected only by its aid; in others the cause of symptoms can be identified and located only by the same instrument. It is therefore required for the recognition of primary vesical tuberculosis and tumors; for detecting the source of vesical hæmorrhage; for differentiating between renal and vesical hæmaturia or pyuria; for ascertaining whether one or both kidneys are the seat of a suppurative process; and for deciding whether an apparently normal kidney is secreting its proper share of urine. In addition it is often useful in the detection of encysted and pocketed stones inaccessible to the sound, and in the visual location of foreign bodies: through the modified instruments of Casper and Nitze the ureter has been catheterized in the male. In short, in many cases of obscure urinary disease the cystoscope is indispensable.

There are, however, certain limitations to its use: prominent among these is the extreme sensitiveness of the bladder which renders that viscus incapable of retaining the minimum quantity of water essential to cystoscopic examination, namely, four or five ounces; this condition results most frequently from tuberculosis of the bladder or prostate, and from acute septic conditions—all of which would be injured by any instrumentation; profuse bleeding into the bladder renders satisfactory cystoscopic examination impossible through the rapid obscuration of the visual field. Aside from these cases there are but few in which cystoscopic examination cannot be made in the adult even without anæsthesia; through this instrument the physician can inspect the surface of the bladder and may find an unsuspected stone, tumor, or ulcer as the cause of previously unexplained symptoms; he can observe not only the absence of pus or blood from the stream issuing from each ureteral orifice, but also note possible swelling around that orifice (often indicating ureteritis and pyelitis); and by counting the jets of urine from each ureter he can make a fair estimate as to the relative amount of fluid secreted by each kidney: this item may be of great importance when a surgical operation on either kidney is contemplated.

The Urethroscope.

Of the many instruments devised for the purpose of rendering the urethral surface accessible to the eye, but three types deserve mention: 1. The simple cylindrical tube through which light is reflected from a head-mirror; 2. The electric urethroscope, the incandescent lamp in which is carried either at the outer or the inner end of the tube; 3. The aëro-urethroscope (devised by Antal and improved by Fenwick), by which the urethra is inflated with air during the inspection. The last-named method gives the only satisfactory view of the urethra, but it can be used for obvious reasons only in the penile portion; for the inspection of the deep urethra one of the other instruments must be employed. In a limited number of cases the urethroscope is most valuable: certain cases of gleet dependent upon localized diseased areas, and cases of morbid sensations due to similar areas and to polyps, can be cured only through the aid afforded by this instrument; yet it must be admitted that these cases are not numerous.

Catheterism of the Ureters.

The aid in both diagnosis and treatment to be derived from the introduction of a catheter into the vesical orifice of the ureter has long been apparent, and for many years different means to that end have been devised; only recently, however, has catheterism of the ureter become entirely practicable in the female and possible in the male. By the method of Kelly and Pawlik the introduction of a special catheter into the ureter of the female can now be accomplished, usually without anæsthesia. By greatly elevating the hips of the patient, the bladder becomes distended with the air which enters through a tube 40 mm. or more in circumference, which is introduced after the urethra has been gradually dilated by conical plugs. Light reflected from a head-mirror reveals the ureteral orifices, into which a delicate catheter or sound can be passed; and elastic bougies can be made to traverse the ureter to the pelvic brim, sometimes even to the renal pelvis.

By this method the urine from each kidney can be separated from that of its fellow as well as from admixtures furnished by the vesical surface—the diagnostic advantages of which are apparent; moreover, strictures of the ureter are detected and even dilated; and it has been found possible to flush the renal pelvis itself.

In the male the ureter can often be catheterized by the aid of special cystoscopes, notably that of Casper; yet the mechanical difficulties due to the presence of the cystoscope materially limit the practical results of this measure.

Therapeutic Notes.

Tincture of cantharides, in 1- to 3-minim doses, often exhibits a marked influence in quieting vesical irritation ("cystitis") as well as in decreasing congestion of the sexual organs (chordee, nocturnal emissions). This is empirical (and uncertain) therapeutics.

The Chlorates.—The chlorate of potassium, or better, the same salt of sodium, has a pronounced soothing and hæmostatic effect upon the mucous membrane of prostate and bladder. A watery solution of sodium chlorate, 2 to 10 per cent., injected into the bladder, is a most efficient agent for arresting vesical hæmorrhage from any cause, including cancer and papilloma, as well as for soothing the inflamed surface in any case of cystitis where the cause cannot be removed.

Codeine may be advantageously substituted for morphine for the relief of vesical irritation.

Cocaine should be used in the urethra with extreme caution, if at all; the record shows a surprisingly large number of cases of toxic effects from simple surface applications.

Guaiacol.—The anti-pyogenic and anæsthetic effects of this drug find a wide application in the treatment of genito-urinary diseases. As a local application (one part to three of glycerin or olive oil) it is valuable in the treatment of epididymitis, whether gonorrhœal, septic, or tuberculous; and in cystitis and pyelitis. Administered by the mouth, especially when combined with salicylic acid, which dissolves readily in it, guaiacol has a demonstrable value in limiting pyogenic processes in any part of the genito-urinary organs. In watery solution (1 : 200) it may be advantageously used in combination with hydrastine as a urethral injection in purulent urethritis from any cause.

Nuclein.—The various preparations supposed to depend for their activity in part at least upon nucleinic acid—Vaughan's solution, thyroid extract, protonuclein—have a decided, though varying, effect in combating septic and tuberculous infections; they should be given internally, and when practicable applied locally.

Silver Salts.—Certain salts of silver, especially the citrate and lactate, have demonstrated their efficacy as local means for combating septic infection, and have been used in watery solution (1 part to 500 or more of water) for irrigating pus-cavities and the urethra.

Thiosinamin, made from mustard oil by the action of ammonia, is a thoroughly reliable agent for the gradual removal of cicatricial tissue. In $\frac{1}{4}$- to $\frac{1}{2}$-grain doses, dissolved in alcohol and water, three times daily for weeks together, it causes a perceptible absorp-

tion of the fibrous tissue of strictures, prostatic fibroids, and cicatrices.

Turpentine oil is the best internal hæmostatic, especially for renal bleeding: it should be given in 1- to 3-drop doses, on sugar or in emulsion, every three hours.

Hydrastine, applied as a saturated solution of the muriate, is an exceedingly efficient agent in arresting the suppuration of gonorrhœa.

DISEASES OF THE EYE AND THEIR TREATMENT BY THE GENERAL PRACTITIONER.

By CASEY A. WOOD, M. D.

GENERAL CONSIDERATIONS.

In recent years experience has to some extent modified the views that were once held as to the value of that long list of remedies which the surgeon had come to regard as necessary in the treatment of ocular affections. Our faith in the efficacy of many of them has, it is true, been confirmed, but in the case of others either we do not employ them to the same extent as formerly or we do not use them at all. This attitude proceeds from the conviction that results supposed to flow from the exhibition of the older remedies may be obtained by other, simpler, less expensive, or less painful means, or that more harm than good is done by employing them in ophthalmic practice.

As to the remedial agents that have appeared during the past four or five years, some will probably be retained as being specially effective in the treatment of eye-diseases, but, just as in other departments of medicine and surgery, certain agents at first loudly and authoritatively recommended, not having stood the test of time and experience will eventually be consigned to the oblivion they deserve.

Finally, new applications of old remedies are being constantly advised.

In these pages particular attention will be paid only to those drugs and appliances of recent vogue that seem to be most effective.

Cleansing of the ocular structures as a preliminary to operations is regarded as of greater importance than ever. Elaborate experiments have shown that—(1) It is practically impossible to absolutely sterilize the conjunctival sac, the lachrymal passages, the eyelashes, or the lid-margins. (2) When powerful antiseptics are employed with this object in view the vascular disturbances set up by them largely neutralize any good that the resulting antisepsis may have brought about. (3) The most effective and least injurious agents are those that, acting mechanically, remove the pathogenic organisms, reduce their numbers, and weaken their power for evil. Thus, copious irrigations of the eye with mild sterilized aqueous mixtures with formalin (1 : 5000–

3000), or of solutions of common salt, boric acid or sodic bicarbonate, or with sterilized water alone, are much to be preferred to the employment of strong mercuric chloride, iodide, or cyanide solutions, although these latter are much more potent as bactericides.

Wilson of Detroit advises the following preliminary precautions:

1. The skin surrounding the eye should be well cleansed with sterile, neutral soap and water.

2. The eye should be thoroughly irrigated with a warm 1 per cent. solution of common salt.

3. The instruments are to be immersed in boiling water for a few seconds and then wiped dry with a soft sterilized towel.

4. The operation should be made as rapidly and accurately as possible.

5. The wound should then be irrigated with salt solution; and

6. The subsequent dressings sterilized by heat only.

7. When possible do not disturb the dressings until primary union has occurred.

8. The patient's general health should receive the utmost attention before, during, and after the operation.

DISEASES OF THE CONJUNCTIVA.

INFLAMMATION of the conjunctiva is of special importance because, in its various forms, it is the commonest disease of the eye. In the majority of instances this inflammation is due to infection by pathogenic micro-organisms and their toxins. No doubt mechanical abuse, vasomotor disturbances due to changes of temperature, dust, smoke, and wind predispose to attacks, but bacterial invasion stands as the exciting cause of this as well as of many other inflammatory diseases of the eye. Recent investigations have shown that even the healthy conjunctiva, the lid-edges, the cilia, and the palpebral skin are a favorite resting-place for some thirty kinds of microbes, including almost all the organisms, innocent and pathogenic, that infect the rest of the body. The moment the resistance of the tissues is sufficiently reduced there is always at hand a supply of these agents ready to set up a conjunctivitis of some kind or other.

The importance of the differential diagnosis between certain common inflammatory affections of the ocular structures, especially between acute conjunctivitis, acute iritis, and acute glaucoma, cannot be overestimated. To mistake one of the last two of these diseases for a conjunctivitis is to be a party to the production of blindness in the patient under observation, and yet such a fatal error is not uncom-

monly made. The accompanying table of symptoms will assist the practitioner in his efforts to treat successfully any of these acute inflammations:

Acute Conjunctivitis.	Acute Iritis.	Acute Glaucoma.
Pain: Little or none. Foreign-body sensations.	Severe, supraorbital pain, getting worse toward night.	Very severe and neuralgic in character. Is referred chiefly to the supraorbital branches of the fifth nerve. The scalp of the affected side often feels sore to the touch.
Discharge: Mucous and mucopurulent, or as flakes of lymph.	Profuse and watery.	Scanty, and fluid in character.
Vision: Not affected, or only slightly impaired.	Affected from the first.	Greatly impaired. Halos appear about lights. Foggy vision.
Pupil: Reacts promptly to light and accommodation. Presents the normal size and appearance.	Contracted; sluggish, or immovable.	Widely dilated and motionless.
Photophobia: None.	Always more or less marked.	Present, but not so marked as in iritis.
Disease affects: Both eyes in the majority of cases.	Often one eye only.	Usually one eye only.
Change in iris: No change in color or other appearance.	Discoloration, with loss of velvety gloss. Sometimes lymph-deposits on its surface.	Loses its brilliant gloss.
Posterior synechiæ: None.	Commonly present.	None, unless secondary iritis has occurred.
Injection of bulbar vessels: Coarse congestion of vessels.	Fine pericorneal injection.	Congestion of the episcleral veins as well as pericorneal injection.
Lachrymation: Little or none.	Abundant flow of tears.	Not so marked as in iritis.
Morning adherence of lids: Almost invariably occurs.	None.	None.
State of conjunctiva: Swollen, opaque, and roughened.	Slightly hyperæmic, but transparent in early stage of disease.	Slightly hyperæmic palpebral conjunctiva.
Cornea: Unaffected.	Rarely hazy.	Hazy; anterior chamber shallow.
Intraocular tension: Normal.	Rarely much increased.	*The eyeball is decidedly harder than normal.*
Tenderness on pressure: None.	Marked.	Often absent.

Catarrhal conjunctivitis, also known as simple, acute, or mucopurulent ophthalmia, is best treated by simple and non-irritant applications, particularly when there is discomfort, pain, or photophobia present.

Gentle irrigation with weak solutions has been generally recommended in recent years and its results are often quite marked. The reservoir of the irrigator is filled with the warmed and sterilized fluid and placed not more than a few inches above the head of the recum-

bent patient. A steady stream, directed from one canthus to the other, flows over the diseased parts into a pan placed to catch it. The following are the solutions commonly employed:

Formalin,	3 minims (0.20);
Sterilized water,	1 quart (1000.).

The eye to be gently irrigated four times daily. Apply to the lid-edges at night:

Calomel,	$1\frac{1}{2}$ grains (0.10);
Lanolin,	150 " (10.).

Another:

Sodic chloride,	75 grains (5.);
Sterilized water,	1 pint (500.).

Still another:

Sodic biborate,	
Boric acid,	of each 4 drachms (15.);
Boiled water,	1 pint (500.).

A very useful one when much pus is secreted is—

Chlorine water,	12 drachms (50.);
Sterilized water,	1 quart (1000.).

In the later stages of the disease the following is of value and should be dropped into the eye three times daily:

Antipyrin,	7 grains (0.40);
Distilled water,	$2\frac{1}{2}$ drachms (10.).

When there is much mucous discharge nascent argentic iodide has been highly recommended. This is made from—

I.	Potassic iodide,	50 grains (3.32);
	Distilled water,	50 minims (3.60);
	Pure glycerin,	100 minims (6.50).
II.	Silver nitrate, crystallized,	50 grains (3.56);
	Distilled water,	50 minims (3.50);
	Pure glycerin,	100 minims (6.50).

Mix 2 drops of solution II. with 3 drops of solution I. and brush the conjunctiva of the averted lids thoroughly with the freshly precipitated silver iodide.

Another mixture that acts very nicely when there is much secretion present is *finely powdered thioform* (dithyosalicylate of bismuth), flecked with a camel's-hair brush upon the cleansed conjunctiva lining the lids. Gallicin, dusted into the eye in the same way as the preceding and for the same purpose, has been recently advised, but this agent causes considerable pain and should not be used unless the eye has been previously cocainized.

When the mucous membrane is rough and secreting freely, it may be touched lightly, after cleansing, by means of borated cotton wound on a probe or wooden toothpick, saturated with the following:

Mercuric cyanide,	15 grains (1.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

This should be immediately washed off with distilled water.

Panas has lately advised the following to be used as a lotion in the second stage of simple acute conjunctivitis:

Beta-naphthol,	15 grains (1.);
Alcohol, enough to dissolve this in	
Distilled water,	1 quart (1000.).

It should be freely applied with a medicine-dropper.

A moderate irrigation of the conjunctival sac may be obtained by using a large pipette, and a number of useful agents may be thus applied to the inflamed surfaces in this disease. A very effective solution for this purpose is—

Sodic sulphate,	75 grains (5.);
One p. ct. sol. common salt,	8 ounces (250.).

This should be instilled, when quite warm, four or five times daily.

In every case of catarrhal conjunctivitis a simple ointment should be applied to the lid-margins at night, to be washed off in the morning. One of the best of these is—

Lanolin,	3 drachms (12.);
Oil of almonds,	
Distilled water,	of each $\frac{1}{2}$ drachm (2.);
Attar of rose,	1 drop.

Purulent conjunctivitis, most commonly observed as *ophthalmia neonatorum* and *gonorrhœal ophthalmia*, is best treated in the early stages by soothing applications and iced gauze.

The strictest cleanliness of the internal ocular structures should be observed. *Cerebral irrigation of the sac with mild antiseptic solutions*

constitutes the most effective adjunct to other forms of treatment. To touch the cornea with the irrigating tube, camel's-hair pencil, cotton wads, or fingers is to invite ulceration of the cornea and blindness. Both surgeon and nurse should exercise the greatest care and gentleness in opening the lids and applying the remedies. Frequent cleansings are better than strong caustics.

So far as drugs, in the stage of profuse discharge, are concerned, the mixture recently introduced by X. C. Scott is recommended:

Hydrastine sulphate,	
Boric acid,	
Borax,	of each 5 grains (0.35);
Tincture of opium,	½ drachm (2.);
Distilled water to make up	1 fluidounce (30.).

Mix and filter.

To be instilled into the eye frequently.

Instead of using silver nitrate, Hoor and others recommend argentamin (ethylendiamin-silver-phosphate) as having greater powers of penetration and as being consequently more effective than the nitrate. A 5 per cent. solution is to be thoroughly brushed over the everted lids as often as is desired. Hoor says of it, after many experiments, that the result of treatment was at least what might have been expected from silver nitrate, but that it should be used in solutions from three to five times stronger than the lunar caustic. He further claims that it possesses all the advantages of silver nitrate and none of its disadvantages; it may be applied in the presence of corneal complications, and is even well tolerated in inflammatory states of the iris and ciliary body. Like most other salts of silver this phosphate preparation should be kept in a dark bottle.

When Buller's shield (a watch-glass set in a window made in a patch of adhesive plaster and applied so that the former comes directly in front of the sound eye) is used to prevent infection, the purulent discharge is still more effectively shut out if a thin strip of absorbent cotton be moistened with collodion and attached over the edge of the plaster.

Reich-Hollender advises a lotion and cold compresses of

Chlorhydrate of quinine,	15 grains (1.);
Distilled water,	3 ounces (90.).

To be used as an adjunct to other treatment, especially after the eye has been thoroughly irrigated with some of the weak lotions previously mentioned as being valuable in the catarrhal form of conjunctivitis.

When the swelling and vascular injection of the lids have some-

what subsided instillations of the following may be made with advantage:

Tannin,	23 grains (1.50.);
Distilled water,	5 drachms (20.).

Heinz advises, instead of the offensive iodoform, that *finely powdered dermatol* (basic gallate of bismuth) be blown upon the everted lids, or be applied in the pencil form.

The following mixture has recently been employed in France as an irrigating fluid—as soon as the discharge becomes profuse. It is not intended to be used alone, but is more efficacious as a bactericide than the simple solutions mentioned under the heading Simple Catarrhal Conjunctivitis:

Labarraque's liquid,	30 minims (2.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

Like other irrigating liquids it should be used warm—twice a day.

Kalt has had considerable experience with calcic permanganate, which he considers effective and non-irritating. He advises 1 gramme to 3 litres of water at 25° C. One eye to be irrigated with one-half of this two, three, or four times daily, as required. One or two additional irrigations with warm sterilized water may also be employed.

When pain is present ten drops of the following may with advantage be added to any of the irrigating fluids used in the treatment of this serious disease:

Extract of opium,	15 grains (1.);
Glycerin,	
Distilled water,	of each 30 minims (2.).

Ten drops are to be added to each litre of the fluid in the irrigator.

Browne has had signal success in treating conjunctival blenorrhœa with the following solutions, and he has found that they act quickly and satisfactorily:

I.	Magnesic trichlorophenolate,	15 grains (1.);
	Distilled water,	$3\frac{1}{2}$ ounces (100.).
II.	Magnesic trichlorophenolate,	30 grains (2.);
	Distilled water,	$3\frac{1}{2}$ ounces (100.).

As soon as the stage of suppuration sets in, irrigation of all the parts in the conjunctival sac (especially *under* the lids) should be made twice a day with solution II. As the swelling and discharge subside

somewhat this should be continued with solution I. The irrigations should be kept up for a quarter of an hour on each occasion.

Finally, in conjunction with the application of silver salts directly to the diseased conjunctiva, there is probably no better irrigating fluid than—

Formalin,	$\frac{1}{2}$ ounce (15.);
Distilled water,	$1\frac{3}{4}$ pints (800.).

This mixture is non-irritant and is a very active destroyer of pyogenic bacteria.

Trachoma, or true granular lids, must of course be treated with reference to its complications, and to the form of the disease. Above all, it must not be forgotten that the acute manifestations of this formidable affection are usually aggravated by astringents recommended in the chronic forms. In the acute exacerbations of the common form of the disease, where a considerable discharge is noted, the modern treatment is that of simple acute conjunctivitis. Iced compresses soaked in—

Boric acid,	
Borax,	of each 75 grains (5.);
Rose-water,	$2\frac{1}{2}$ drachms (10.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

should be applied five or six times daily until the ocular discomfort is allayed. Exuberant granulations are best treated by expression with Knapp's forceps. Affixed to the ends of the blades of these are small creased rollers, removable for sterilizing purposes. The conjunctiva is grasped between the rollers and the follicles are effectually squeezed without damage to the mucous membrane. When this is done any of the classic astringent remedies, preferably the *lapis divinus*, may be applied to the diseased surfaces.

Sattler, of Prague, prefers *dialysed tannic acid* (*i. e.* tannin free of gallic acid) to be dusted upon the trachomatous surfaces daily.

When the lids do not show small hard granulations and there is no marked pannus, massage of the lids upon the globe with certain ointments will be found to be of signal advantage. Either of the following may be employed in this way:

Mercurous oxide,	45 grains (3.);
Vaseline,	1 ounce (30.).

Mix thoroughly in a mortar and gently massage the eyeball once every day or so.

Dilute citrine ointment, made with brown cod-liver oil (instead of the official lard oil),	1 ounce (30.);
Brown cod-liver oil	$2\frac{1}{2}$ drachms (10.).

To be mixed with the aid of gentle heat and allowed to stand exposed to the air, but protected from dust, for a week before using. This is a smooth, semi-liquid salve, which should be introduced into the conjunctival sac on the point of a probe and used exactly like the foregoing.

When corneal complications are present, especially pannus, a watery solution of creolin has been strongly recommended :

Creolin,	15 grains (1.);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

To be dropped into the eye twice a day alternately with 1 : 400 solution of mercuric chloride.

Diphtheria of the conjunctiva is not uncommonly seen in association with the same disease of the throat and nose, and its diagnosis should, as in suspected diphtheria elsewhere, be confirmed by the usual bacteriological examinations. Where the Klebs-Loeffler bacillus is isolated full doses of the appropriate antitoxin must be employed. This has been done with the best results.

Nicati has recently advised—

Loretin (derived from quinolin),	
Calomel,	of each 15 grains (1.);
Finely powdered boric acid,	2 ounces (50.).

This is dusted upon the infected surface while the lids are similarly treated; the whole to be covered with a sterilized cotton dressing.

Chronic catarrhal conjunctivitis sometimes follows one or more acute attacks, but is as often, perhaps, kept up by some form of eye-strain which, when possible, should be relieved. The subsequent treatment should be a soothing one. Carter advises that a few drops of the following mixture be instilled into the eye twice a day, to be followed by one drop of a 1 : 300 zinc sulphate solution :

Boric acid,	$3\frac{1}{2}$ grains (0.20);
Cocaine muriate,	$1\frac{1}{2}$ " (0.10);
Distilled water,	1 ounce (30.).

Massage of the lids upon the ball with equal parts of glycerin and distilled water is of considerable value. A small quantity of the fol-

lowing may also be employed in the same way, once a day, if it does not cause too much irritation. In the latter case the proportion of iodol is to be decreased:

Iodol,	30 grains (2.);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

Follicular conjunctivitis must not be mistaken for trachoma, chiefly because the treatment of the former disease is simple and successful, while true granular lids, due to the invasion of the deep structures of the conjunctiva by a specific microbe, is very difficult to dislodge and its ravages so often affect the other ocular tissues. In the acute stage the enlarged follicles should be treated by iced compresses saturated with 1 per cent. solution of common salt. These applications should be made four times a day for ten minutes at a time. In the chronic form, as well as when the acute symptoms have subsided, Trousseau advises the instillation, twice a day, of two drops of the following:

Zinc chloride,	$\frac{1}{6}$ grain (0.01);
Distilled water,	75 minims (5.).

In addition to these, gentle massage of the lid upon the eyeball may be made, once every two or three days, with this ointment

Iodol,	30 grains (2.);
Vaseline,	
Lanolin,	of each 75 " (5.);
Attar of rose,	1 drop.

DISEASES OF THE LIDS.

Blepharitis marginalis is the name usually applied to a number of affections of the lid-edges that present quite different pathological pictures. Clinically, however, they may be divided into the ulcerative, eczematous, squamous, and hypertrophic.

As a rule, the majority of these yield readily to treatment. Concomitant eye-affections, especially diseases of the conjunctiva and lachrymal apparatus, should be carefully looked after. The probable existence of eye-strain should not be forgotten. The general health is not uncommonly at fault.

The following preparation of ichthyol is of signal value in most forms of marginal blepharitis:

Sulpho-ichthyolate of ammonium,	$1\frac{1}{2}$ grains (0.10);
Lanolin,	$2\frac{1}{2}$ drachms (10.).

To be applied to the borders of the lids once or twice a day.

In the squamous variety Gradle advises, to be used in the same way:

Ichthyol,	$7\frac{1}{2}$ grains (0.50);
Zinc ointment,	$2\frac{1}{2}$ drachms (10.).

Where the points of insertion of the eyelashes into the lid-margin are plainly seats of any form of the disease, these cilia should be extracted before rubbing in the salve.

In the ulcerative form Fuchs advises that the following application be smeared on a compress of fine linen and the whole fixed upon the affected eye, over night, with a bandage:

White precipitate,	$2\frac{1}{2}$ grains (0.15);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

In addition to this treatment the cup-shaped and ulcerated depressions that often form in this variety of the disease should be touched, once daily, with a 20 per cent. solution of argentamin. When crusts or scales adhere to the lid-margins these should be gently removed after soaking them half an hour with borated cotton wet with sterilized hot water. In rebellious cases the ulcers may be curetted and then have applied to them this solution:

Mercuric iodide,	15 grains (1.);
Pure olive oil,	8 ounces (250.).

Mix with the aid of a gentle heat, and filter.

In eczematous blepharitis the following mixture is useful, but it must be remembered that it discolors the lashes:

Hydrogen dioxide,	1 ounce (30.);
Vaseline,	5 drachms (20.);
Lanolin,	$2\frac{1}{2}$ " (10.).

In cases where the lid-edges are red and irritable a very good wash, to be applied for five minutes at a time three or four times daily, is—

Lanolin,	
Gum arabic,	of each 75 grains (5.);
Boric acid,	15 " (1.);
Distilled water,	$3\frac{1}{2}$ ounces (100.);
Extract of violet,	10 drops.

This should be followed, just before retiring, by smearing the edges of the lids with—

Calomel,	$\frac{1}{3}$ grain (0.20);
Lanolin,	$2\frac{1}{2}$ drachms (10.).

In the simple hypertrophic form Gradle advises a mixture of resorcin and sulphur:

Milk of sulphur,	
Resorcin,	of each 15 grains (1.);
Vaseline,	1 drachm (4.).

A small quantity is to be applied to the lid-margins at night. In the same way may be employed this ointment:

Aristol,	15 grains (1.);
Vaseline,	
Lanolin,	of each 75 grains (5.).

The following formulæ are valuable in the squamous variety:

Birch oil (oleum rusci),	
Olive oil,	of each equal parts.

To be applied with a cotton swab.

Beech-nut oil,	
Olive oil,	of each equal parts.

To be applied in the same manner.

Styes.—Although these painful inflammatory affections of the glands supplying the lid-margin are often due to general ill health, it must not be forgotten that the exciting cause is frequently eye-strain, to be relieved only by the wearing of glasses or the correction of anomalies of the external ocular muscles. The most recent additions to the list of drugs used in their local treatment are the following:

Mercuric iodide,	7 grains (0.40);
Olive oil,	$3\frac{1}{4}$ ounces (100.).

Dissolve with the aid of heat and filter.

This should be applied several times daily to the incipient stye. A salve, to be used in the same way and for the same purpose, is—

Mercuric iodide,	$\frac{1}{3}$ grain (0.02);
Vaseline,	$2\frac{1}{2}$ drachms (10.).

When repeated attacks have occurred, the lid-edges should be thoroughly smeared, every day for three months, with—

Aristol,	$7\frac{1}{2}$ grains (0.50);
Vaseline,	
Lanolin,	of each 75 " (5.).

Lanvole recommends for this purpose, also, bathing the lids regularly with—

Salicylic acid,	76 grains (5.);
Borax,	45 " (3.);
Distilled water,	10 drachms (300.).

Or with—

Ammonium chloride,	15 grains (1.);
Precipitated sulphur,	45 " (3.);
Spirits of camphor,	5 drachms (20.);
Rose-water,	$1\frac{1}{2}$ ounces (50.).

DISEASES OF THE LACHRYMAL APPARATUS.

Dacryo-cystitis—an inflammation of the mucous membrane lining the tear-passages, especially of that of the tear-sac—may be acute or chronic, simple catarrhal or purulent. An obstruction, due either to swelling of the mucous membrane or to an organic stricture, is usually present, preventing the flow of tears into the nose. Nasal catarrh, as productive of dacryo-cystitis, should be borne in mind. Remedies (usually operative procedures) should, consequently, be resorted to for the purpose of relieving this latter condition, while various solutions, applied with the lachrymal syringe or forced into the sac (Gould) with the tip of the forefinger, may be relied upon to reduce the swelling in the mucosa and to relieve the other inflammatory symptoms. The regurgitation of muco-pus from the lachrymal into the conjunctival sac is a common cause of catarrhal *conjunctivitis*, and that fact should be remembered in all cases of chronic catarrh of the lids.

Thomalla advises the following mixture, under the name "rhinalgin," as a suppository, twice a day, in each nostril:

Alumol,	$\frac{1}{6}$ grain (0.01);
Ol. valerian,	
Menthol,	of each $\frac{3}{8}$ " (0.6);
Cocoa butter,	15 grains (1.0).

The following solution may be injected into the sac and tear-passages in chronic cases:

Aluminium acetate,	45 grains (3.);
Distilled water,	$2\frac{1}{2}$ drachms (100.).

The irrigator is of great value in catarrhal diseases of the tear-passages, and if a blunted hypodermic needle be attached to the irrigating tube the lachrymal sac may be washed out even through the intact puncta lachrymalia. When a canaliculus has been slit, for the purpose of introducing probes or for enlargement of the passage, lavage of the diseased parts can be more readily accomplished. For this purpose there is no better irrigating fluid than—

Formol,	15 grains (1.);
Distilled water,	2 quarts (2000.).

After irrigating with a boric acid solution a small quantity of this mixture may be injected into the sac:

Antipyrin,	37 grains (2.50);
Distilled water,	$2\frac{1}{2}$ drachms (10.).

If the purulent catarrh be very marked, and particularly if it be complicated with abscess of the sac, an effective irrigating fluid is—

Potassic permanganate,	15 grains (1.);
Distilled water,	8 ounces (250.).

Duclos prefers to this a 50 per cent. solution of fluorol, which he finds much less irritating. Irrigation may be preceded by a cleansing injection of equal parts of hydrogen peroxide and water or by a 4 per cent. solution of sodic bicarbonate.

Where a fistulous opening remains after the bursting of a lachrymal abscess it may be closed by cauterization of the abnormal passage. This is well done by carrying a probe-end, armed with a little cotton dipped in lactic acid, well into the depths of the fistula. A superficial slough forms, is cast off, and the opening closes. Lately steresol (a compound resembling collodion) has been used to form a covering over the opening. This may be repeated as often as is necessary.

Chalazion (*retention cyst of a Meibomian tubule*).—Many authors have lately contended that strain of some portion of the ocular apparatus may, by producing hyperæmia of the lid-structures, causes these little tubules to be closed and the secretion of their corresponding

glands to be retained. Apart from surgical intervention the condition giving rise to chalazia requires consideration. Massage with a simple stimulating ointment is nearly always of value in preventing stenosis of the remaining ducts in multiple cysts of this character. Darier recommends the following formula for this purpose—to be applied once daily:

Neapolitan ointment (French codex),	2 drachms (8.);
Potassic iodide,	15 grains (1.).

A simple and effective agent, for massage, is—

Lanolin,	90 grains (6.);
Oil of almonds,	
Rose-water	of each 15 " (1.).

Chemosis of the Lids.—This is usually a sign of local lesion (black-eye, acute conjunctivitis, ulcer of the cornea) but may be due to cardiac disease. In any event it may be relieved by a single dose, daily, of—

Quinine sulphate,	4 grains (0.25);
Freshly powdered digitalis leaves,	2 " (0.10).

DISEASES OF THE CORNEA.

INFLAMMATIONS of the various structures of the cornea may be confined, in considering their etiology, to the area occupied by this membrane, but as a rule corneal inflammations form a part of processes affecting other portions of the eye, or are merely signs of general dyscrasiæ. Belonging to the latter class are two diseases almost entirely confined to children, viz. *phlyctenular keratitis* and *specific infiltration of the cornea.*

Phlyctenular Keratitis.—Among the various causes of this disease is acute nasal catarrh, especially the hypertrophic variety; indeed, this disease of the nose, which was at one time spoken of as a common accompaniment of the ocular affection, is now regarded as the origin of the micro-organisms (especially the *coccus flavus desidens*) that subsequently find lodgment in the conjunctiva and cornea.

In the treatment of phlyctenules of the cornea, associated with the same lesions in the bulbar conjunctiva, general hygiene, particularly in strumous subjects, is of the first importance. Indeed, there are few instances where purely local treatment is of much avail, because, if

the nose or the systemic condition be neglected, one may confidently expect either a very slight improvement of the eye-symptoms or an early recurrence of the infection.

When the phlyctenules have reached the stage of ulcer each one may be touched with a match-end dipped in—

Benzo-phenonide (apyonin)	15 grains (1.);
Distilled water,	7 drachms (100.).

Then a bandage for four hours. This solution instilled into the sac, three or four times a day, is also advised:

Boric acid,	
Borax,	of each $\frac{1}{2}$ drachm (2.);
Rose-water,	$\frac{1}{2}$ ounce (16.);
Distilled water,	$1\frac{1}{2}$ ounces (45.).

Mydriatics are very useful in phlyctenules of the cornea. Instead of atropine, scopolamine (1 grain to 2 ounces of water) is effective.

Another lotion, especially when there is conjunctivitis, is—

Mercuric chloride,	15 grains (1.);
Distilled water,	5 quarts (5000.);
Alcohol,	q. s.

This is more effective when employed, three times daily, with the irrigator.

As soon as the acute symptoms have subsided the globe may be gently massaged, once a day, with—

Ammonium sulpho-ichthyolate,	$1\frac{1}{2}$ grains (0.10);
Vaseline,	
Lanolin,	of each 75 " (5.).

This salve makes a useful application to the lid-margins (at night-time) and to the eczematous patches on the face that so frequently accompany the corneal and conjunctival eruption.

Interstitial Keratitis.—*Parenchymatous, syphilitic, specific,* or *strumous* disease of the cornea is merely local evidence of a constitutional disorder. It runs such an extremely chronic course and so invariably ends in more or less complete resolution that it is difficult to say what part treatment has had in determining a successful cure.

Anti-syphilitics should always be administered in cases where the specific disease, apart from the eye-lesion, is plainly marked. However, even when, in the course of months, the cornea has regained

most of its transparency the patient may be found to be almost blind from disease of the ciliary body, choroid, or optic nerve. When mercury is employed it is best administered in the shape of inunctions—two grammes daily of lanolin and blue mass, equal parts. Grandclément claims that when there are no acute symptoms and the globe is not sensitive to pressure a cure results in from forty to ninety days, from massage of the eyeball daily, every two hours, with the following mixture:

Phenol,	15 grains (1.);
Liquid vaseline,	3½ ounces (100.);
Oil of wintergreen,	a few drops.

If this produce pain the eye should be cocainized before the next application. As an internal remedy the following pleasant mixture, in doses of from one to two desertspoonfuls, may be used:

Potassium iodide,	5 ounces (159.);
Glycerin,	1 ounce (30.);
Mercuric iodide,	1½ grains (0.10);
Syrup of quinine (Fr. codex),	6 ounces (200.);
Anisette (Bordeaux),	3½ " (100.).

Hypodermic injections, repeated every two days, may be given instead of inunction, as follows:

Mercuric chloride,	1½ grains (0.10);
Sodic chloride,	15 " (1.);
Distilled water,	3 drachms (10.).

Ten to fifteen minims once daily.

For the prevention of posterior synechiæ, rotoin (from *Scopolia japonica*) is useful where atropine is contraindicated. By some authors it is claimed that this glucoside is preferable to the mydriatics usually instilled, as it does not irritate the lids even when employed for several weeks or months. A good formula is—

Rotoin,	1 grain (0.05);
Cocaine muriate,	1½ grains (0.10);
Distilled water,	1 ounce (30.).

Punctate keratitis, the so-called serous iritis, is usually a sign of chronic intraocular disease and should be treated accordingly. Darier has recently suggested for it the internal administration of colchicin, and gives the following prescription:

Crystals of colchicin,	1 grain (0.06.);
Sugar of milk,	1 drachm (4.).

Make into 60 granules and give from 1 to 3 daily, gradually increasing the dose until stomachic colic, or other signs of intolerance, appears. It is better to administer this remedy on alternate weeks.

Ulcers of the Cornea.—These may, for clinical purposes, be divided into two classes: (1) The simple, non-spreading ulcer; (2) The serpiginous or spreading variety. Both lesions are usually the result of an erosion or wound (however slight) with subsequent infection. The character and number of the micro-organisms, the resisting powers of the invaded tissues and the extent and situation of the corneal traumatism determine the severity of the disease.

Simple ulcer is usually small, single, and of a grayish-white appearance, and may be accompanied by considerable photophobia, lachrymation, and pain.

Spreading ulcer is a much more serious disease, although its beginning may be the same. Especially when the supply of pyogenic bacteria, from a purulent ophthalmia or dacryo-cystitis, is large and vigorous, widespread and rapid destruction of the cornea may result. It is hardly necessary to say that this fact should always be borne in mind when treating the corneal lesion. In all varieties of ulceration of the cornea irrigation of the conjunctival sac is of paramount importance, whether this remedy be employed before or after direct applications to the ulcer itself, or whether it be used solely as a curative measure. In the simple variety Joenicke's boro-borax is very effective. This is made by dissolving equal parts of boric acid and borax in water, boiling, and allowing the product to crystallize. A warm 10 per cent. solution may be used for irrigation. Under the name of *antipyonin*, disodic dodecaborate, a similar compound, has been recommended, in the same dose and to be used in the same manner, by Rolland. Antipyonin is also used, instead of boric acid, as an application, in the form of fine powder, to the conjunctiva in the suppuration which often accompanies corneal ulcer.

A very effective cautery of the ulcer may be accomplished by means of lactic acid. After thorough cocainization a pointed wooden tooth-pick is dipped into a 30 per cent. solution and carefully and thoroughly applied to the diseased area. A small slough separates in the course of a few days. Galezowski uses, instead of lactic acid, for cauterizing the ulcer, a 1 per cent. mixture of gold carbolate. In the same way one may apply to the ulcer, and with the best results, a few crystals of the sozoiodolate of zinc. This forms a white eschar which does not spread beyond the limits of the diseased surface. The application may be repeated, as the cauterization is not a deep one and leaves a very slight scar, or it may be followed by gentle massage, once a day (Goldzieher), with—

Sodic sozoiodolate,	8 grains (0.50);
Neutral atropine sulphate,	1 grain (0.05);
Vaseline,	2 grains (10.).

A few drops of a solution of rotoin or scopolamine should be instilled every three or four hours, when the ulcer is centrally situated and there is pain or other acute symptoms. Where atropine is indicated Jackson advises the following collyrium:

Neutral sulphate of atropine,	
Cocain muriate,	of each 1 grain (0.05);
Distilled water,	2 drachms (8.).

One drop of this at a time.

Large disks, made with gelatin and iodoform, to be carefully applied to the cocainized eyeball and followed by an antiseptic bandage, have been recommended, but these are painful and seem to possess little advantage over dusting the surface with finely powdered iodoform. Vacher has employed an eye-wash of a watery solution (1 : 250) of potassic permanganate. Di Vincentiis advises the employment of subconjunctival injections of sodic chloride and mercuric chloride in spreading ulcer complicated with hypopyon (pus in the anterior chamber). In the majority of instances a single injection is all that is necessary, but in the worst cases two or three doses, at intervals of one or two days, may be required. De Wecker has quite lately given very explicit directions for the employment of this remedy. He believes that when properly carried out there is no agent more prompt in effecting a cure of all forms of corneal ulcer. The eyelashes are first disinfected with a 1 : 100 solution of mercuric oxycyanide, and the conjunctival sac is then thoroughly irrigated with a 4 per cent. solution of boric acid. Fifteen drops of the following solution are now injected beneath the conjunctiva as near the ulcer as possible:

Mercuric chloride,	$\frac{1}{4}$ grain (0.015);
Eserine salicylate,	1 " (0.05);
Distilled water,	$3\frac{1}{2}$ ounces (100.).

This should be repeated daily, if necessary, but the dose should be diminished as soon as improvement is noticed. Each injection should be followed by an antiseptic bandage. When iritis is present scopolamine should be substituted for the eserine.

As most of these subconjunctival medications are painful they have sometimes added to them a small quantity of cocaine. Dolganoff claims that a 1 per cent. solution of paraclorophenol in water forms

an analgesic injection that acts quite as quickly as the mercurial salt, and that the pain following it is slight and lasts only a few minutes.

When simple ulcer of the cornea is associated with a chronic conjunctivitis, dacryo-cystitis or blepharitis, massage, once a day, with either a mixture of europhen ($\frac{1}{2}$ to 1 per cent.) or aristol (1 per cent.), with equal parts of vaseline and lanolin, will be found efficacious.

Where simple ulcer of the cornea does not promptly heal it may be touched with a 1 : 10 solution of iodine trichloride, the sac being subsequently irrigated, twice a day, with 1 : 1000 of the same remedy.

Corneal scars (*nebulæ, maculæ*) are most likely to be reduced in area and thickness by pressure-massage with stimulating ointments. One of the best of these, to be applied once daily for weeks or months, is—

Yellow oxide of mercury,	$1\frac{1}{2}$ grains	(0.10);
Iodol in fine powder,	$7\frac{1}{2}$ "	(0.50);
Vaseline,		
Lanolin,	of each 75 "	(5.).

Scleritis and Episcleritis.—Inflammatory patches characteristic of both these affections have been successfully treated by the application of the galvano-cautery. Internal treatment is almost always called for, and search should be made for the presence of any of the well-known causes of these diseases. Absorption of the scleritic plaques is certainly helped by massage with an ointment composed of sodic iodide 0.25 gramme and vaseline 10 grammes. If the deeper structures of the sclera be affected, Puech has advised the painting of both lids every morning for five days with the ordinary tincture of iodine. Finally, subconjunctival injections, as described under Iritis, are found to act well in most instances.

Herpes of the Cornea.—*Herpes zoster ophthalmicus* is usually a part of a neuritis affecting the minute nerve-endings in and about the conjunctivæ and lids and it should be treated in connection with the other manifestations of the disease. The corneal vesicles are serious lesions, owing to the resulting scars and the possible visual defect that so often remain when the eruption occupies the pupillary area. Bourgeois advises that the eye be carefully irrigated with warm boric acid lotion and the cornea afterward dusted with the following powder:

Bismuth subnitrate,		
Powdered starch,	of each 62 grains	(4.);
Aristol or iodol,	$7\frac{3}{4}$ "	(0.5).

In addition, the eye should be protected and pain relieved by morphine or antipyrin. When there is iritis dry heat and a collyrium of $\frac{1}{4}$ per cent. solution of scopolamine are also indicated.

To the vesicles on the lids may be applied this salve:

Zinc ointment,	6 drachms (22.50);
Boro-glyceride,	2 drachms (7.50);
Carbolic acid,	26 grains (1.75).

Or, when the pain is very severe, this:

Cocaine muriate,	$7\frac{1}{2}$ grains (0.50);
Iodoform,	1 drachm (4.);
Vaseline,	$7\frac{1}{2}$ drachms (100.).

The pain of herpes is also greatly mitigated by the local application to the vesicles or dried scabs of finely powdered euphorin (phenyl urethan).

IRITIS.

Inflammation of the iris is one of the commonest and most important ocular diseases with which the practitioner has to contend. In the great majority of instances it is symptomatic of some general disorder or accompanies some other disease of the eye. It is well to remember that it may be a local expression of syphilis, rheumatism, gonorrhœa, tuberculosis, gout, scrofula, or diabetes. These general diseases should always receive attention as a part of the treatment of iritis because the duration and severity of the ocular affection may be considerably lessened thereby.

The pupil should be dilated as early in the disease as possible, and although atropine, duboisine, hyoscyamine, and hyoscine must continue to be the most valuable agents in the accomplishment of this result, we have recently added a number of other valuable mydriatics to the list.

An excellent and effective substitute for the ordinary 1 per cent. solution of atropine, usually ordered in cases of iritis, is the following:

Neutral sulphate of duboisine,	
Neutral sulphate of atropine,	of each $\frac{1}{2}$ grain (0.03);
Cocaine chlorhydrate,	35 grains (2.);
Distilled water,	7 ounces (190.).

Instillation of a single drop of a $\frac{1}{2}$ per cent. of scopolamine hydrochlorate forms an effective substitute for atropine preparations. All of these cycloplegics may give rise to general toxic symptoms if care be not employed in the use of their watery solutions. When possible these should be instilled after meals. Only one drop at a time should be dropped into the conjunctival sac, and the excess of fluid should be carefully wiped, from the inner canthus outward, off the closed lid-edges.

The treatment by means of subconjunctival injections of corrosive sublimate may be carried out in accordance with the directions of Abadie, *i. e.* four or five doses of $\frac{1}{20}$ of a milligramme ($\frac{1}{1200}$ of a grain) each, at intervals of three days. It has recently been observed that from 5 to 10 drops of a sterile 2 per cent. solution of common salt, injected with a perfectly clean hypodermic syringe, answer all the purposes of the bichloride and are not as painful. Even in syphilitic cases mercurial salts appear to possess no curative advantage over the sodic chloride solution. Indeed, it is now claimed that all subconjunctival injections act chiefly by stimulating the lymphatic circulation and thus hastening the absorption of inflammatory products. The pain following this form of medication is not invariably prevented by the use of cocaine. Instead of presenting such anti-rheumatic remedies as the salicylates in *rheumatic* iritis Crinon advises the tincture of gelsemium in full doses daily. In *gonorrhœal* iritis Fuchs advises 15-drop doses, once a day, of the oil of gaultheria, which is best given in capsules.

The internal treatment of *serous* iritis is considered of importance by Galezowski. He advises that the urate of piperazine be given in $\frac{1}{2}$-gramme doses once or twice a day.

The treatment of the *tubercular* form of iritis is not very satisfactory. The exhibition of creasote (dose 0.05 gramme) in pill form, six times daily, increasing the dose until fifteen pills are taken in twenty-four hours, is recommended by Quint. This treatment should be continued for months. Another remedy is ichthyol. Four drops of a mixture composed of equal parts of this drug and water should be administered three times daily before eating. The dose should be increased one drop daily until forty drops are taken at one dose. To avoid gastro-intestinal irritation the ichthyol should be administered in a large quantity of water. Iodoform, triturated with one-half its weight of powdered coffee, may also be administered in cachets.

It is sometimes difficult to make a differential diagnosis between the tubercular and other forms of iritis. In such cases tuberculin injections may be used. Indeed, Leber has reported a complete cure of tubercle of the iris after ten injections (5 to 10 milligrammes each) of Koch's lymph.

GLAUCOMA.

RICHEY and others regard this disease as essentially one affecting the general nutrition. In any case it must not be forgotten that subsequent attacks may be warded off by general constitutional treatment, by dieting, regular bathing, proper exercise, and keeping the bowels freely open. When signs of gout are present Houde's formula is valuable:

Crystallized colchicine,	1 grain (0.06);
Sugar of milk,	1 drachm (4.);
Gum arabic,	7 grains (0.50);
Simple syrup,	15 " (1.).

Divide into 60 granules and give two, three, or four daily. In the same way, rheumatism or any of its manifestations should be carefully treated. But whatever be the predisposing cause of this formidable disease of the eye, it is directly dependent upon a disturbance of the intraocular lymphatic system. The internal lymph-stream arises from the blood-vessels of the uveal tract, flows from the posterior chamber through the pupil, and empties into the canal of Schlemm at the angle formed by the iris and the sclera. It is easy to understand how any obstruction of this stream of lymph or any abnormal increase of the lymphatic fluid may bring about an intraocular tension dangerous to vision. The eyeball grows harder and the delicate parts within the eye immediately suffer. It is of the utmost importance that this destructive disease should be early recognized, and should not be mistaken, as it often is, for supraorbital neuralgia *plus* conjunctivitis or iritis (see table on p. 985). When such an error is made, atropine or some other mydriatic is likely to be prescribed and a bad matter thus made worse.

Although the most satisfactory measure is a broad, peripheral iridectomy or a posterior sclerotomy, relief sometimes follows certain local applications. In *acute* glaucoma Faber advises the use of pilocarpine nitrate, 0.05 gramme to 10 grammes of distilled water; this is to be dropped into the eye every three or four hours, as long as the intraocular tension is increased. The artificial leech and the internal administration of morphine are recommended for the relief of pain. In the *chronic* form a 25 per cent. solution of antipyrin may be injected, with Anel's lachrymal syringe, into the nasal duct of the affected eye. This procedure not only relieves the pain of the disease, but is recommended as a curative measure.

TOXIC AMBLYOPIA.

A GREAT many poisons exert a deleterious action upon the eyesight, but the most important and most common of these are tobacco and alcohol. They set up a chronic and painless inflammation of the optic nerve, which, however, readily yields to treatment.

There should be total and immediate abstinence from the use of tobacco and alcohol in any of its forms, and the patient should observe every other hygienic rule. When there is no contraindication a Turkish bath twice a week is a valuable remedy. Some such tonic mixture as the following should be prescribed:

Tincture of iron chloride,	4 drachms (16.);
Dilute phosphoric acid,	4 grains (0.25);
Quinine sulphate,	6 drachms (24.);
Strychnine sulphate,	2 grains (0.1);
Tincture of rhubarb,	2 drachms (8.);
Simple syrup,	to make 8 ounces (250.).

A small teaspoonful in a wineglassful of water before each meal.

Hypodermic injections of a 1 per cent. solution of nitrate of strychnine should also be administered three times a week. This solution should be made with distilled water and without alcohol. The initial dose must be small, say five drops, to be increased drop by drop until toxic symptoms are produced. The dose should then be decreased a few drops until the cure is complete.

OCULAR AFFECTIONS IN GENERAL DISEASES.

THERE are certain signs and symptoms exhibited by the visual apparatus and complained of by the patient that do not necessarily indicate organic ocular disease at all, or point only to a partial or secondary involvement of the eye. Graves' or Basedow's disease is one of these. In recent years a number of internal remedies have been employed in the treatment of the eye-symptoms. Chibret gives large doses of sodic salicylate, $\frac{1}{2}$ to $\frac{4}{5}$ of a gramme, four times during the twenty-four hours, dissolved in a large quantity of water. If the patient cannot take such a large dose the amount is diminished, but it must be given for weeks at a time. He has seen improvement, especially of the tachycardia, in a very few days. The following mixture may be taken every two, three, or four hours, unless intoxication is produced, for several weeks at a time:

Powdered digitalis leaves,	$\frac{1}{3}$ grain (0.02.);
Ipecac,	$\frac{1}{2}$ " (0.035.);
Extract of opium,	$\frac{1}{20}$ " (0.0025.).

Amelioration of the symptoms is noticeable in a few days and in some cases a practical cure has been brought about after several months. Exalgine (methyl-acetanilide), in 3-grain doses three times a day, has also been employed with success. Finally, Bogroff has advised the hypodermic injection of extract of the thyroid gland, beginning with a single drop of the organic extract, and increasing the dose until four cubic centimetres are administered.

SYMPATHETIC OPHTHALMIA.

It has been demonstrated to a certainty that germs may be carried from an eye whose coats have been perforated, either by traumatism or from disease, to the opposite eye and there set up a destructive inflammation. The most dangerous wounds, so far as concerns their liability to produce sympathetic opthalmitis, are those that penetrate the region of the ciliary body. This is an area four or five millimetres in width that extends around and a few millimetres outside of the sclero-corneal junction, called by Nettleship the "dangerous zone." Pieces of steel and other foreign bodies lodged in the interior of the eyeball, as well as perforating ulcers of the cornea, may also light up the disease. The earliest sign of this *migratory ophthalmia* is tenderness on pressure over the ciliary region—the patient flinches when the eye is pressed upon. With this are usually noticed inability to read, slight photophobia, lachrymation, and some redness of the eye. Usually there is no pain. The stealthy setting in of these symptoms on the sound side, after a penetrating wound of the other eye, may well cause anxiety, especially when to the tenderness are added sensible impairment of vision, pain, more lachrymation and photophobia, and a deeper injection of the pericorneal vessels. Plastic deposits now take place in the ciliary body, iris, and cornea. If relief be given the eye may partially or wholly recover, but in any event the course of the disease is always very chronic, very variable, and very wearisome to both patient and surgeon. It sometimes happens that months after an attack of sympathetic inflammation the injured eye is found to possess better vision than its fellow. In consequence of improved treatment better results have, in late years, followed the exhibition of remedies for *ophthalmia migratoria*. In the early stage (of sympathetic irritation) it may sometimes be aborted by the inunction of mercurial ointment and the injection, into the vitreous chamber, of one or two drops of corrosive sublimate solution, 1 : 500. This is to be repeated in eight days. Instead of intraocular injections subconjunctival medication has been employed with success, in the strength of 1 : 1000.

Even when sympathetic inflammation has plainly declared itself large subconjunctival injections, combined with the hypodermic use of mercuric iodide or chloride or the inunction treatment, may so modify it that useful vision may be retained in one or the other eye.

OCULAR HEADACHE.

MIGRAINE or sick-headache is frequently accompanied by temporary disorders of sight and is often produced by refractive errors and anomalies of the ocular muscles. Before or during an attack of this distressing form of neuralgia a peculiarly shaped cloud, having often a bright-colored margin, appears before one or both eyes. This spreads until the whole field of vision is obscured and lasts but a short time, after which sight is as perfect as before the attack. Attention should be paid to the refractive condition of the eye, and when ametropia (especially astigmatism and hyperopia) is present proper correcting glasses should be prescribed. In addition to this, numerous prescriptions have been lately suggested for the relief of the pain or for the purpose of aborting the attacks. Among the most reliable of these is the following:

Antifebrin,		1 grain (0.06.);
Phenacetin,		
Exalgine,	of each	1 " (0.05.);
Antipyrin,		8 grains (0.50.);
Cocaine muriate,		$\frac{1}{12}$ grain (0.005.).

This powder is to be given, as early as possible in the attack, every half-hour, but not more than four doses in all should be taken.

The diagnosis of simple ocular headache, as distinguished from migraine, is of such very great importance to the general surgeon that it must be considered as a prelude to the subject of treatment. As I have said elsewhere, it is manifestly the duty of every practitioner, be he specialist or non-specialist, to instruct himself in the natural history of all forms of headache, whether he aspires to remove the cause in a given case or not. Such knowledge would, for instance, deter the oculist from attempting to treat a malarial headache by cutting the external rectus muscle, the surgeon from dividing the supraorbital nerve for the cure of a unilateral neuralgia due to monocular astigmatism, the physician from persevering with quinine, phenacetin, or antipyrin to effect a cure of that frontal distress which accompanies and is one of the common symptoms of recurrent glaucoma; the rhinologist from making the devious ways of the nasal meatus straight because his lady patient complains of the dull vertical

headache of uterine disease, and so on to the end of the chapter. The characteristics of *ocular headache* may be set down as follows:

1. *Forty per cent.* of all headaches and *eighty per cent.* of all frontal headaches are partially or wholly of ocular origin. They are of all varieties, from a "dull sensation" to suffering of the most intense character, and may affect the patient at any time of the day, but they practically never wake him from sleep.

2. Their site, in order of frequency, is supraorbital, deep orbital, intracranial, temporal, supranasal, vertical, and occipital.

3. Near work is their chief exciting cause—*i. e.* reading, writing, drawing, painting, fancy-work, typesetting, typewriting, sewing, music, etc.

4. Patients suffering from ocular headache often observe that other eye-symptoms also result from the use of the eyes for near work—especially with artificial illumination.

5. Shopping, theatre- and church-going, as well as riding in street cars and railway trains, often induce it.

6. The letters and lines in reading and notes in music blur, run together, and get "mixed up."

7. The patient with ocular headache is generally astigmatic or has some refractive error.

8. Patients with ocular headache often complain of lachrymation, photophobia, foreign-body sensation, specks floating before the eyes, itching and burning of lids, redness of eyes, etc.

9. The symptoms of eye-strain above mentioned may be present and the headache be of ocular origin, although the vision is normal and there is no manifest astigmatism. The patient in such a case overcomes his hypermetropia or astigmatism, or both, by continuous muscular effort.

10. About *ten per cent.* of all ocular headaches are *incurable.*

For the temporary relief of this form of headache there is probably no better local application than the so-called oleate of veratrine, and it is certainly preferable to the internal administration of many vaunted specifics. The formula is—

Veratrine,	150 grains (10.);
Oleic acid,	$3\frac{1}{2}$ ounces (100.).

The skin over the painful region is to be first thoroughly rubbed with a dry towel and then massaged with a very small quantity of the ointment. This is a very irritating mixture and care should be observed that none of it is introduced between the lids. The application may be repeated every hour or two, but the possibility of intoxication, due to absorption of the veratrine, should not be forgotten.

PARALYSIS, SQUINT, AND OTHER MUSCULAR DISORDERS.

Abnormal attitudes of the eyeball are taken in cases of *heterophoria* (muscular insufficiencies), *ocular paralysis*, and *strabismus* or squint.

When affected by either squint or paralysis, both eyes are not directed toward the same quarter in all positions of the globes. One disease may easily be differentiated from the other by the simple expedient of testing the excursion of each eyeball in all directions. Examined separately they will be found to have a normal excursion in squint while restricted movement in one or more directions can be detected when a muscle (or muscles) is affected by paralysis.

Paralysis.—Although it is usual to speak of paralysis of the eye-muscles, yet for clinical reasons it is advisable not to forget their nerve-supply. For, as a matter of fact, it is the nervous function that is disturbed or abolished, and if one recollects the ocular innervation paralytic diseases of the muscles resolve themselves naturally into well-defined clinical groups. It is mainly for purposes of diagnosis—when one wishes to discover what particular muscle is involved—that prominence is given to the loss of muscular function.

There are certain symptoms common to all forms of paralysis. The most important of these is *diplopia*. This occurs in every instance where vision in both eyes is good, and is due to the fact that images of objects do not fall on corresponding parts of both retinæ. It is by the relation of these double images—a somewhat difficult subject for the student—that most authors seek to indicate the particular muscle affected. Vertigo and even nausea—the nervous effects of the diplopia and of false projection—as well as indistinct vision are symptoms frequently complained of. Headache is not uncommon. The patient, to avoid the annoyance of double vision, will usually close one eye or turn his head toward the paralyzed muscle. This sign often indicates which muscle is affected.

Causes of paralysis are chiefly rheumatic or syphilitic affections, either of the nerves themselves in their course from the brain or of their nuclei. Organic deposits in the bony canals along which most of the cerebral nerves run, or exostoses from their walls, as well as growths from the neurilemma, may exert pressure sufficient to bring about a temporary abolition or a total loss of their function. The reabsorption of these growths or deposits may result in a cure unless too great damage has been done to the nervous elements. When one nerve alone is affected the cause is probably a peripheral one, while nuclear paralysis is to be suspected if more than one nerve suffers.

Although syphilis and rheumatism play a very important rôle in

the causation of these pareses it is sometimes difficult to demonstrate their presence. A few cases, however, result uniformly from one cause; paralysis of the external rectus, for example, almost invariably occurs in rheumatic subjects. Diphtheria sometimes produces orbital paralysis and is a cause of cycloplegia with dilated pupil (iridoplegia). These paralyses are present in (usually as an early indication of) locomotor ataxia. Paralysis of the external rectus is not unusual in diabetes.

Diphtheritic paralysis and the *primary* paralysis of tabes almost invariably disappear. So do most of those that depend upon peripheral causes. If of central origin many syphilitic cases get well, but some do not. For obvious reasons the later tabetic pareses persist, as well as many others of central origin.

It is justifiable to cover the affected eye with a shield so as to guard against the troubles of diplopia. Specific treatment will be given when it is indicated, and even when there is no definite history of syphilis potassic iodide, administered in gradually increasing doses until 30 or 40 grains or more are taken three times daily, may be continued for several weeks or months.

In conjunction with the internal administration of potassic iodide (in cases of paralysis suspected to be due to syphilis), De Wecker advocates the hypodermic use of corrosive sublimate, and advises this formula:

Mercuric chloride,	15 grains (1.);
Sodic chloride,	30 " (2.);
Morphia acetate,	6 " (0.40);
Distilled water,	$3\frac{1}{3}$ ounces (100.).

A Pravaz syringeful contains 0.01 centigramme of sublimate. One-half of this should be injected daily, or every two days, observing strict antiseptic precautions. Ten injections are usually sufficient. De Wecker asserts that this form of medication is valuable even in the non-syphilitic varieties of ocular pareses.

Cupping the temple in the early stages and the employment of the constant current (2–4 milliampères) are remedies of extreme value. Cocainize the eye and place the negative pole (a small sponge) between the lids directly over the paralyzed muscle. The positive pole may be applied to the neck. This can be kept up for three or four minutes at a time and is a better plan than the usual application of a larger sponge to the closed lids.

Strabismus or Squint.—This affection is sometimes called "concomitant" squint, because, although the relation of the visual axes is not a normal one, it is a constant relation—one eye moves about

when the other does. In "paralytic" squint this is not the case. Much confusion arises from the calling of paralytic diseases "squint," and it would be better to confine that term to the conditions about to be described.

The two most important and by far the commonest varieties of this disease are *convergent* and *divergent* strabismus.

Most squinting eyes manifest themselves if the patient be directed to look first at a near point, say 30 cm., in front of his nose and then at some distant object.

In the early stages of the crossed eyes of children convergent strabismus may be checked by preventing the use of the vision for near work. The kindergarten school should be avoided, and the child encouraged to play out of doors. He should not be taught to read or allowed to play much with toys requiring near vision until the time arrives for glasses or operation. One drop of a weak (1 : 500) solution of scopolamine, rotoin, or atropine (1 : 250) should be dropped into each eye twice a day for two weeks out of every month, as long as swelling of the lids, dry throat, or flushed face is not produced. As long as the pupils are dilated from this use of mydriatics dark glasses should be worn. Later, the patient should be given a *full* correction of all refractive errors. Weak scopolamine or atropine drops are also to be prescribed for a few weeks and glasses worn constantly. In a fair percentage of hypermetropic cases this alone will bring about a complete cure in the course of several months or a year. If, after such a trial, little or no improvement results, an operation is indicated.

DISEASES OF THE EAR AND THEIR TREATMENT BY THE GENERAL PRACTITIONER.

By S. MacCUEN SMITH, M. D.

GENERAL CONSIDERATIONS.

As the title of this chapter indicates, the following pages will be devoted to a brief consideration of the more common diseases of the ear, the treatment of which should become quite as requisite a part of the practice of every physician as the more prominent branches of general medicine and surgery. The fact that the medical profession has not duly appreciated this responsibility, so justly imposed upon it, enables us to account for the present multitude of aural diseases, so many of which tend to become incurable and eventually act as a daily menace to life itself. When we remember that the great majority of ear-diseases will yield to prompt and efficient measures for relief, if instituted in the acute stages of the attack, it would seem almost unpardonable to permit the existence of so many chronic aural affections.

Speaking generally, serious complications result chiefly from the chronic form of aural disease. The inclination, therefore, has been to feel secure, at least as regards danger to life, when an acute disturbance is under treatment. The experience of the writer, however, has been quite contrary to this usually accepted rule; in fact, within a period of eleven months he has seen twenty-seven cases of mastoid disease,[1] each one of which was directly traceable to an acute inflammation of the tympanic cavity. In some of these cases the mastoid empyema was clearly due to meddlesome interference, while in others no treatment whatever had been established. We frequently find that physicians make no attempt to treat acute conditions of the ear, either from an entire lack of interest or because they have been taught that the treatment of aural disease was quite difficult, and often attended with considerable danger. This incorrect impression has undoubtedly hindered the general practitioner from acquiring methods of recognizing and relieving the many acute diseases of the ear, and prevented this very important branch of medicine from becoming the benefit to

[1] Many of these cases were treated in the Otological Clinic of the Jefferson College Hospital.

suffering humanity that it is otherwise capable of being. As acute diseases of the ear are usually seen first by the general physician, the future welfare of the patient makes it imperative that the gravity of the affection should be immediately recognized and prompt measures for relief instituted, in order to prevent the disease from passing into a chronic state, accompanied, as so frequently happens, by most serious results.

Etiological Factors.—The great majority of ear-diseases occur in infancy and early life, and especially during the prevalence of the exanthematous fevers. It is of the greatest importance, therefore, that the ears should be given especial care during these attacks, as the tympanic infection is liable to at once become severely purulent, and thus cause rapid destruction of the soft parts. It should be remembered that, with one or two exceptions, a strictly primary disease of the tympanic cavity or labyrinth never occurs. The etiology, therefore, should be carefully considered before treatment is instituted, or failure to improve many cases must be a natural consequence.

Next to the eruptive fevers, the most frequent cause of aural disease is an extension of some pathological lesion from the naso-pharynx through the Eustachian tube into the cavity of the middle ear. The nose and throat, therefore, frequently present etiological factors other than those of the infectious fevers which must not escape observation and correction. In brief, it is safe to assume that most aural affections are secondary to some other existing trouble, the correction of which is as important an element in the line of treatment as the relief of the ear-disease itself; and experience has shown that the failure to recognize this simple fact has been the chief cause of much inefficient treatment.

We may here call particular attention to the influence that epidemics of infectious influenza (*la grippe*) have exerted as a causative factor in the development of severe aural disease. The specific poison (bacillus of Pfeiffer) seems to have a special predilection for causing an active infection (by continuity) of the middle ear, and subsequent or even simultaneous implication of the mastoid. These complications have been quite common during the recent epidemics, and were characterized by the inflammation being very severe, with increased suffering and a manifest tendency for repair to take place slowly, although ultimate recovery was the rule.

Anatomical Relations.—The brevity of this article will make it necessary for the writer to assume that the reader is sufficiently familiar with the anatomy of the ear, and the methods of examination of the same, to enable him to effectively apply the various therapeutic measures suggested for the relief of pathologic conditions. It should be remembered, however, that the same integument that envelops the

auricle extends into and acts as a covering for the external auditory canal, and finally, being considerably modified, forms the outer layer of the membrana tympani; and also that the mucous membrane of the throat and naso-pharynx extends up through the Eustachian tube, forms the lining of the tympanic cavity, covers the ossicles, extends into the mastoid process, and comprises the inner layer of the membrana tympani. By bearing in mind these anatomical facts one can readily appreciate the facility with which disease may be conveyed by continuity into the middle ear and mastoid. Furthermore, it will serve to make us more cautious when making applications or treating this organ, so as to avoid stirring up any inflammation by rough treatment.

In order to understand why so many fatal complications arise from a disease of the tympanic cavity, it is only necessary for us to recollect that the walls of the tympanum are always thin, and in some cases the roof is entirely absent; and also that a portion of each of the temporo-sphenoidal lobes and the lateral lobe of the cerebellum are in direct contact with the middle ear. We should also remember that the carotid canal (through which passes the carotid artery) forms the anterior wall of the tympanic cavity, and the jugular fossa (in which lies the bulb of the jugular vein) constitutes the floor of the tympanum. This explains how a dangerous and even fatal hæmorrhage may occur as the result of caries and necrosis caused by a destructive suppurative disturbance of the middle ear.

DISEASES AND INJURIES OF THE AURICLE.

NOTWITHSTANDING the exposed position of the auricle, diseases due to traumatism are comparatively infrequent, this immunity being due to the elasticity of its framework. With one exception (othæmatoma), affections of the auricle, such as scalds, burns, frost-bites, cysts, warts, tumors, malignant or benign, occur as in other parts of the body. Their treatment, being the same as that adopted in other localities, need not be further considered here.

Othæmatoma, or Blood-tumor of the Auricle.—This peculiar sanguineous tumor may appear on any part of the anterior surface of the auricle, and is either idiopathic or traumatic in origin. In the former variety it is mostly seen in persons affected with cerebral disease, although it is probable that many cases supposed to be spontaneous are in fact due to traumatism, either self-inflicted or the result of violence on the part of an attendant. Whatever the etiology of this tumor, it appears as a swelling, which at times fills up the entire con-

cavity of the auricle, and causes considerable bulging outward. This swelling is due to the effusion of blood or serum between the perichondrium and cartilage, thus separating the one from the other. Should this fluid be allowed to remain thus confined, it will either gradually become absorbed or go on to suppuration.

TREATMENT.—Traumatic cases receive most benefit from cold applications, especially during the acute inflammation. Applications of the tincture of iodine, gentle pressure, and massage of the tumefaction are advocated by various authors. Should the case be seen early, while the contents are fluid, the best results are obtained by free incision and thorough evacuation of the tumor, followed by packing with iodoform gauze, and moderate pressure, to prevent deformity as much as possible. This same treatment should also be carried out in cases of suppuration.

Generally, it is well to first try expectant treatment, but, if this fails, evacuation of the tumor under the usual antiseptic precautions will give the best general results, although some deformity usually occurs. When possible, the line of incision should be so directed that the subsequent cicatrix may be somewhat hidden beneath the margin of the helix. The gauze packing must be renewed for several days, or until the cavity of the wound assumes a healthy appearance, when sutures can be used to coaptate the edges, the pressure being continued until repair is complete. When this has been accomplished, massage will prove of service in preventing a recurrence of the disease.

OBSTRUCTIONS AND DISEASES OF THE EXTERNAL AUDITORY CANAL.

IMPACTED CERUMEN.

THE accumulation of what is usually known as "wax in the ear" is very common, its composition being either cerumen, desquamated epithelium, inspissated pus, or hairs, or several of these intermingled.

As a rule, patients are not conscious of the accumulation until they suddenly experience more or less impairment of hearing. So long as the mass does not completely fill the canal it does not usually interfere with the hearing. The ceruminal glands are mostly confined to the cartilaginous portion of the canal; the collected wax, therefore, will generally be found just beyond the meatus, in which position its removal will be accomplished without difficulty. At times, however, the accumulation is located in the osseous portion of the canal, and may impinge upon the membrana tympani, producing marked deafness. Its removal from this locality without injury to the canal or drumhead requires considerable care, and espe-

cial caution will be necessary where extreme narrowing of the canal is present. When a collection of wax is found in the deep meatus, it is probable that it was pushed into that position either by an attempt at its removal or by some meddlesome efforts to cleanse the ears. The sudden deafness sometimes produced by impaction is caused either by the mass becoming moist, allowing it to completely fill the canal by swelling, and so exclude all sounds, or, in an effort to remove the wax, the plug is forced against the membrana tympani, suspending the function of the conducting apparatus, or a small fragment becomes detached and falls against the drumhead, causing tinnitus and deafness.

TREATMENT.—The removal of this obstruction can be accomplished either by the syringe or by various instruments. Those not familiar with the use of instruments in the ear will find the syringe safer and more satisfactory. Fluids should always be *warmed* before being used in the ear. Should the mass be soft it can easily be dislodged by syringing with warm water in which some bicarbonate of sodium has previously been dissolved. Undue force should never be used. When the mass is hard and difficult to dislodge, or syringing produces pain, further efforts for its removal should be discontinued. The patient is then instructed to use some drops (warmed) in the ear (sodium bicarbonate grains 15, glycerin and water, of each half an ounce) for one or two days, to soften the wax, when the obstruction can easily be removed by renewed syringing. Any accumulation that is not removed by this procedure will require the use of a small hook-shaped instrument (Fig. 41) for its entire extraction, or to sufficiently loosen it so that additional syringing will wash it out.

The best syringe is one with a thin, straight nozzle, holding about four ounces. After directing the patient, or an assistant, to hold a concave ear-basin to catch the return water, the canal is straightened by drawing the auricle outward and backward, the syringe being first filled with water. The nozzle should never be introduced farther than just within the external meatus. In this position the solution is slowly forced from the syringe with a rotary motion, the object being to direct the water so that it will pass between the wall of the canal and the obstruction, and not in the direct central axis; in this manner we permit a free return of the water, and do not at any time throw the stream of fluid directly against the membrana tympani—a matter of much importance in many cases. When the return water is quite clear, all the wax, as a rule, will have been removed. The canal should now be dried with absorbent cotton, followed by the application of ung. hydrarg. ox. flav., and a small piece of sterilized cotton should be kept in the meatus for a day or two, to guard against atmospheric changes. In uncomplicated cases normal hearing is usually restored.

While on this subject it is well to enter a serious protest against the popular habit, so uniformly adopted, of dropping oily solutions and other equally objectionable substances into the ear for the relief of pain, etc. These so-called domestic remedies can have no function except their manifest tendency to act as fungus-generating fluids, and thus frequently transform a simple disease into one of serious moment. If a patient suffers pain or other inconvenience from the ear, the case requires intelligent care, and not the adoption of the "hit or miss" methods above alluded to.

Foreign Bodies in the Ear.

It is usual to divide foreign bodies in the ear into animate and inanimate. The animate class comprises every variety of vermin (usually due to personal filth) and insects. Maggots are sometimes found adhering to the drum-membrane, and generally cause considerable pain, tinnitus, and vertigo. The removal of animate objects can usually be accomplished by using the syringe in the manner already described. At times they will adhere tightly to the lining of the canal or membrana tympani, when it is best that they should first be killed by chloroform vapor, or the instillation of equal parts of tincture of opium and tincture of belladonna, before syringing. The opium and belladonna solution will promptly destroy all animate objects and at the same time exert an anodyne effect which relieves the suffering.

Inanimate objects may be separated into two classes: those that are capable, through heat and moisture, of swelling and becoming so enlarged as to completely fill the canal and act as a source of serious irritation, such as beans, coffee-berries, corn, peas, etc. The other class includes objects not materially influenced by heat and moisture, such as cotton-wool, small pieces of slate-pencil, wood and stone, beads, shells, cherry-stones, shoe-buttons, etc. Cases are not infrequent where foreign bodies have remained in the ears for a number of years without producing symptoms of any note. These substances, however, when influenced by heat and moisture usually make themselves felt within a short period; the swelling first causes deafness, and later, as the tension increases, more or less pain. It must be remembered, however, that the serious damage that frequently follows a foreign body in the ear is not so often due to direct irritation from the presence of this foreign matter as it is to the result of *unskilful attempts at its removal.*

With a good light, a head-mirror, and a speculum of proper size, there should be no difficulty in discovering the presence of a foreign body in the ear. Should the object be deep in the canal, and the anterior meatus inflamed and swollen, some trouble may be experienced until the inflammation has been reduced.

TREATMENT.—The removal of foreign bodies from the meatus will at times severely tax the ingenuity of the most skilful operator. Usually the first thought is to employ instruments of various kinds, and it is the yielding to this temptation that frequently converts a condition of little importance into one of considerable magnitude. Let it be remembered that instrumentation, as a rule, inflicts more or less damage to some part of the conducting apparatus; that the employment of instruments for the removal of extraneous matter from the ear is but rarely indicated, and should only be used under perfect illumination and with extreme care; that the proper use of the syringe and warm water will usually dislodge and expel the majority of all foreign bodies. The cases that present difficulties for their removal are those liable to changes from heat and moisture, such as corn, peas, etc., especially when located deep within the canal and beyond the constriction formed by the junction of the cartilaginous with the osseous canal. The expansion of the tympanic end of the meatus will allow an object of this character to swell so much that its removal as a whole becomes quite impossible. If, therefore, after repeated syringing with hot water or sweet oil (in the manner already described), the obstruction cannot be removed, and you are satisfied that instrumentation is necessary, it is best that the patient be anæsthetized. It is well, however, as soon as general relaxation from the anæsthetic has been accomplished, to again resort to syringing (holding the affected ear downward, resting over the edge of the operating-table) before instruments are used.

Should this final effort with the syringe prove unsuccessful, nothing remains but to employ one or more of the several instruments devised for such purposes. In our experience a very delicate sharp-pointed hook (Fig. 41) will give the best results. The hook is intro-

FIG. 41.

duced flatwise, resting against the canal. As soon as it passes beyond the obstruction the point is rotated in such a manner that with slight traction it will draw the object out, or at least loosen it sufficiently to allow renewed syringing to accomplish the purpose. Other instruments, such as forceps, probes, etc., may also be used, but as the hook above referred to occupies a minimum of space (an essential point), it has in most cases answered our purpose best. Should the foreign body have been forced into the tympanic cavity, it may be necessary to separate the auricle posteriorly, in order to gain direct access to the osseous meatus. If this does not prove effective, the posterior

wall of the canal must be chiselled away until the middle-ear cavity is reached. Such a severe injury to the canal or middle ear may result in fatal cerebral abscess, meningitis, etc., but if this is avoided the prognosis is always favorable as regards serious consequences, although much damage to the hearing from careless manipulation is of common occurrence.

Diseases of the Canal.

Inflammation of the meatus should be considered under two heads, circumscribed and diffuse.

Circumscribed otitis externa, known also as *boil* or *furuncle* of the external auditory canal, as its name indicates is a disease restricted to a definite area. Several distinct boils may, however, occur simultaneously in various parts of the canal, or a succession of furuncles may follow each other; quite a "crop" has been seen in one ear. They are very common and may appear in any part of the canal, but are generally found in the cartilaginous portion. In origin they are either traumatic or specific, the latter class frequently occurring as epidemics. Traumatic cases often result from the irritation caused by the introduction of various chemicals and instruments into the meatus. It has long been a question in the mind of the writer whether all cases of furuncle of the external meatus were not due to micro-organisms. The staphylococcus pyogenes aureus is almost invariably found in the pus of boils of the meatus, and certainly, if this infectious germ can find its way through the skin in so-called "idiopathic" cases, it would seem less difficult to infect a surface already rendered pregnable by an injury. However this thought may be received it is generally conceded that furuncles can be artificially produced by rubbing sound skin with staphylococci; furthermore, boils of this character yield most promptly to the application of powerful germicides.

Predisposing factors in the development of furunculosis are of importance, and will include any disease or condition debilitating the general health, such as diabetes, anæmia, etc. Catarrhal conditions of the throat and nose are noticeably present in those suffering from boils of the meatus; while decay of the teeth, or other dental irritations, should be looked for. To be brief, any disease that diminishes the power of resistance in the tissues of the meatus will eventually convert the parts into a productive field for the rapid development of micro-organisms. If, in this "run-down" condition, one should receive an injury of the canal, and then be subjected to the influence of staphylococci, it can readily be seen why a supposed traumatic case may in reality be one of infection, developed from a specific poison, the injury simply acting as a predisposing cause.

It is an easy matter to overlook small incipient boils. Usually,

however, the introduction of a speculum will cause sufficient local pain to indicate the point of development. In more advanced cases the furuncle is readily seen, but may be mistaken for an exostosis, the differentiation being that the former is exceedingly painful to the pressure of a probe, and that there is a marked tendency to become multiple. The pain from furunculosis is generally severe, especially when the boil is located in the osseous portion of the meatus, where the skin of the canal (acting also as the periosteum) is unusually dense, and resists the tension caused by the formation of pus. For clinical purposes a furuncle in this location is identical with felon of the finger, but is, however, subject to greater necrotic danger. Should a boil develop on the superior part of the osseous canal, and the pus not be evacuated, either by rupture or incision, caries may follow, and this in turn result in fatal meningitis or brain-abscess.

TREATMENT.—Many lines of treatment, both local and general, have been suggested for the relief of this painful affection; but unless such therapeutic measures have for their object the destruction of disease-germs, they must in a measure be unreliable and disappointing. It must be remembered that the pus from boils is highly infectious; auto-inoculation, therefore, will be frequently encountered unless careful antiseptic precautions are strictly observed, so that the bacteria-laden pus will not reach other parts of the canal. The important object of treatment is the immediate relief of suffering, together with the limitation, modification, or abortion of the inflammatory process. Our ability to accomplish one or more of these purposes will largely depend on the stage the disease has reached before treatment is instituted, as well as the germicidal properties of the remedies employed.

In the majority of cases early incision, followed by an antiseptic dressing, will deplete the parts, thereby relieving the tension and consequent pain. When pus-formation has already occurred, a free incision down to the bone or cartilage is necessary, for the same reason that only a deep incision is of service in a felon: otherwise, continued pain, burrowing of pus, and possibly necrotic changes, may be expected. A majority of incipient boils will be aborted by introducing into the canal a cotton tampon saturated with camphor-phenol;[1] this should be renewed every day or every second day, until all evidence of the furuncle has disappeared. Before a fresh tampon is introduced the canal should be gently mopped out with cotton twisted on an applicator, and saturated with alcohol in full strength. When the boil appears to be eradicated, the camphor-phenol tampon

[1] Camphor-phenol is prepared by mixing 45 per cent. of pure carbolic acid with 55 per cent. of camphor, the mixture forming a liquid of powerful germicidal properties and marked anodyne effects.

should be replaced by one moistened with ointment of the yellow oxide of mercury,

℞. Hydrarg. ox. flav.,	gr. ij (0.1);
Ung. petrolei,	ʒj (30.).
M. et. ft. ung.	

or iodoform ointment,

℞. Iodoformi,	ʒiij (12.);
Ung. petrolei,	℥j (30.).
M. et. ft. ung.	

(cleansing each time with alcohol), until the meatus assumes a healthy condition.

When necessary to incise an aural boil, it should be done thoroughly, as suggested above; the after-treatment being the same as in the incipient furuncle, except that the cotton tampon should be slightly larger than the meatus, as the *pressure* will exert a beneficial influence by favoring rapid absorption and quick recovery. Before a boil is incised the pain incident thereto will be greatly lessened by placing in the canal a camphor-phenol tampon for five or ten minutes. After the pus has been evacuated all suffering will be relieved by immediately introducing a similar tampon. The use of camphor-phenol, when applied for the alleviation or cure of furunculosis of the external auditory canal, is founded on its inhibitory action on the development of the staphylococcus pyogenes aureus, and incidentally on its marked anæsthetic properties. It is, therefore, a powerful germicide and at the same time non-poisonous and non-irritant—an advantage not enjoyed by any other preparation in such concentrated form.

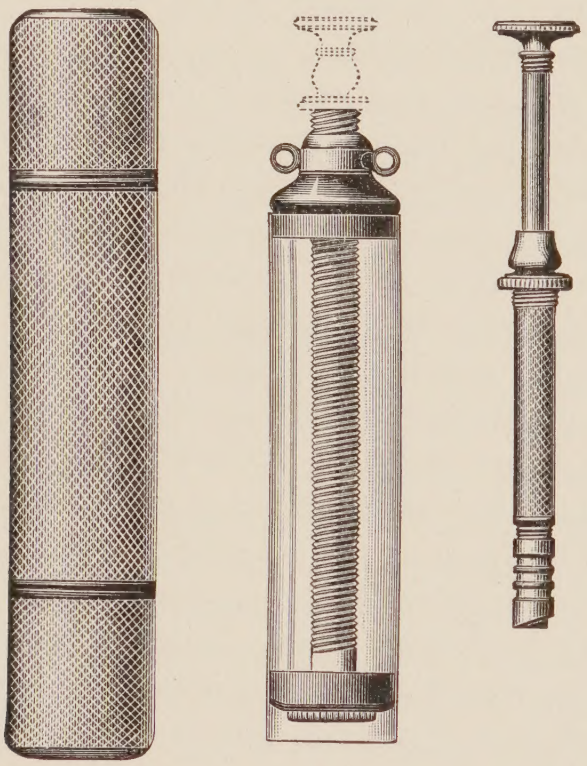
The foregoing line of treatment will meet the requirements of almost all cases of furunculosis of the meatus, and furthermore will prevent auto-inoculation. Other means of treatment are sometimes beneficial, however, and should be used when indicated. In selected cases, bloodletting in front of the tragus, preferably with the artificial leech (Fig. 42), as well as hot antiseptic irrigation, and dry heat, will be of service. Poultices should never be used; the heat and moisture caused by their employment creates an active hotbed for the rapid multiplication of bacteria, and frequently excites an inflammation of the auricle. Moreover, their use is apt to involve the middle ear in an acute inflammation. Any dental irritation, or abnormal condition of the nose and throat should be corrected. In debilitated subjects the general health should receive due consideration. The administration of selected tonics and alteratives, in connection with proper

hygienic surroundings, will do much to assist in the cure of an existing boil, and especially to prevent its recurrence. We would strongly urge the use of arsenic in the form of Fowler's solution, given in increasing does until the physiological effects are produced; a course of this drug to be repeated several times if necessary.

Otitis Externa Diffusa.—In contradistinction to circumscribed otitis externa, the diffused form of inflammation is one that may involve the entire canal, but is usually confined to the osseous portion.

It is claimed that this disease is frequently idiopathic in origin, but we believe it is always due to some direct or traceable cause, keeping

FIG. 42.



in mind parasitic infection. Diffused inflammation of the canal is most frequently associated with a chronic suppurative otitis media, notwithstanding the fact that the discharge may be very slight. It is evident, then, that tympanic suppuration is the most important causative factor in its development; the perforation of the membrana tympani may be very small, and therefore easily overlooked, but careful observation, together with inflation, will prevent our falling into this error. Next in frequency are mechanical, chemical, or thermal irritants, such as the unskilful use of instruments, the presence of foreign bodies, the application of concentrated chemicals, or the introduction into the ear of solutions either too hot or too cold. Certain constitutional disturbances, such as diphtheria, syphilis, scrofula, etc., as well as chronic furunculosis, should receive due consideration.

The important symptom is pain, increasing in severity as the cellular tissue, and subsequently the periosteum and bone, become

involved. Implication of the osseous structure occurs only in neglected and chronic cases. The presence of granulation-tissue indicates bone-necrosis, and should receive particular attention, especially if the roof of the meatus is the part involved, as the inflammation may extend inward and cause meningitis. Considerable swelling of the meatus will be noticed, being more pronounced when the osseous portion is the seat of the lesion. Deafness and tinnitus are prominent symptoms, varying in degree according to the amount of swelling and suppuration, and consequent interference with the function of the membrana tympani. When primarily the middle ear is not the cause of an otitis externa, it may become involved in the inflammatory process by continuity of structure. As previously stated, the presence of *discharge* —always associated with middle-ear suppuration—is an etiological symptom of the greatest importance. Otitis externa diffusa diphtheritica, and syphilitica, have constitutional symptoms and local appearances characteristic of each, making their recognition not difficult.

The gravity and prognosis of individual cases will depend largely upon the etiology, as well as the portion of the canal affected; also whether the inflammation is superficial, or extends to and involves the osseous structure; and lastly, whether middle-ear suppuration is present, in which event considerable swelling of the canal may interfere with the free escape of pus. In all forms of otitis externa, with involvement of the deeper structures, a more or less *chronic dermatitis* may remain after cessation of the acute symptoms.

Treatment.—The term otitis externa diffusa may include all inflammations and irritations of the external auditory canal, except that known as circumscribed (furunculosis). This wide range of inflammatory conditions, therefore, may include either a simple erythema or a severely active inflammation which may implicate the bony structures; or, as in syphilis, diphtheria, etc., may prove to be infectious. Obviously, constitutional treatment is of the greatest importance in some cases, while in others simple local applications will suffice. It is well to regard each individual case as possessing, to some extent, characteristics of its own; hence we should aim to discover the cause, and direct active treatment for its prompt removal (not forgetting the general health), and recovery will follow in most cases.

While the inflammation is acute, bloodletting in front of the tragus, together with hot antiseptic irrigation of the meatus will be of service. A good antiseptic solution for irrigating the ear is the following:

℞. Glycerini, f℥j (30.);
Liq. acid. carbolic. (pure), f℥iij (90.).—M.
Sig. Add one-half to one teaspoonful to a half pint of water, and irrigate as the case may require.

The fountain syringe is much safer and better than the hand syringe generally used. Instillations of warm alcohol, black-wash, or lead-water and morphine will, on account of their anodyne effect, be of service:

℞. Liq. plumbi,
Liq. morphiæ, āā. f ʒiv (16.);
Aquæ, f ℥x (300).—M.
Sig. Add a tablespoonful to a wineglassful of water, and syringe the ear several times daily.

The bowels should be freely opened by small doses of soda and calomel, repeated p. r. n. In mild cases the inflammation will readily subside by first mopping the canal with alcohol, and then applying either ung. hydrarg. ox. flav. or ung. iodoformi, as previously referred to. This should be repeated every second or third day. When the discharge (not due to middle-ear suppuration) persists, nitrate of silver solution (gr. xl to f ℥j) applied to the surface is indicated.

Should these measures fail, the walls of the canal must be freely incised in the most dependent point or points. Bleeding should be encouraged, as depletion will give prompt relief, and recovery in most cases is greatly facilitated thereby. After incision the canal can be cared for by application of the ointments above mentioned. Early incision is to be preferred rather than too long expectant treatment, thereby preventing osseous involvement, necrosis, tympanic suppuration, etc. Constitutional treatment must be carefully considered, and therapeutic measures administered for the general benefit of individual cases.

Otomycosis.—This variety of inflammation is due to the presence and rapid multiplication of microscopic fungi in the external canal. The most common form of vegetable growth met with is some variety of the *Aspergillus* (either *fumigatus*, *niger*, or *flavus*). The patient complains of more or less impairment of hearing, and tinnitus; an almost intolerable itching makes the sufferer quite miserable; efforts to relieve this itching by rubbing or picking the ear only add to the progressive discomfort, and may produce an extensive inflammation; some pain is experienced, but usually not severe. An examination with the speculum reveals large quantities of desquamated epithelium. This débris somewhat resembles blotting-paper studded with yellow or black spots, the color depending upon the character of aspergillus present, which, however, can only be definitely determined by microscopic examination. A distinctive diagnostic point in otomycosis is the rapidity with which these masses will recur after removal, sometimes within a few hours.

TREATMENT.—The accumulation is best removed by warm anti-

septic irrigation, followed by instillations of absolute alcohol. The patient's head should be rested on a table, and the ear filled with warm alcohol, which should remain for a few minutes. This can be repeated two or three times a day until all fungi have been destroyed, after which a few applications of the yellow oxide or iodoform ointment will quickly restore the canal to its normal condition.

DISEASES OF THE MIDDLE EAR.

Diseases of the tympanic cavity have been divided by authors into various forms of acute and chronic inflammation. For all practical purposes it is sufficient to consider diseases of the middle ear under four heads: (1) Acute Non-suppurative Otitis Media; (2) Acute Suppurative Otitis Media; (3) Chronic Suppurative Otitis Media; (4) Chronic Non-suppurative Otitis Media. It is evident, however, that the second form of otitis media is but a continuation of the first, usually made possible only by the neglect or improper treatment of the first variety; likewise the chronic suppurative is only an advanced stage of the acute suppurative, and is also largely the result of neglect or incompetency.

From the foregoing it must be assumed that many cases of both acute and chronic suppurative otitis media are preventable. In support of this assumption we can without hesitation assert that suppurative diseases of the middle ear are the natural outcome (with comparatively few exceptions) of timidity, neglect, or the application of improper treatment to cases of primary inflammation of the tympanum; it is evident, therefore, that if the initial lesion is promptly and judiciously treated, many acute inflammations of the middle ear will be arrested in the stage of hyperæmia, and thus avoid even an acute suppuration, which should in turn prevent the establishment of a chronic otorrhœa. Special mention is here given to this important fact, for the reason that in this day of advanced preventive medicine it is plainly our duty to carry into daily practice the effective measures now at our command, and thus frequently prevent the development of suppurative inflammations of the tympanic cavity, thereby avoiding many formidable complications arising from diseases of the ear.

Acute Non-suppurative Otitis Media.

Acute inflammation of the middle ear without suppuration (also known as catarrhal inflammation) is the most frequent cause of "earache" in infancy and childhood; nevertheless, the real cause of the child's crying and fretfulness is frequently overlooked.

An extension (through the Eustachian tube) into the middle ear of some abnormal condition of the throat and naso-pharynx is the most frequent cause of this form of tympanic disease. Children are very susceptible to draughts of air striking the ear, or any exposure to dampness. Sea-bathing, the careless use of solutions in the nostrils, dental irritation from decayed teeth or during dentition, are likewise exciting factors. An acute otitis media from any of the above causes will usually yield to prompt treatment, care being taken to remove the exciting cause. If, however, the middle-ear inflammation develops during the course of one of the infectious fevers (scarlet fever, measles, diphtheria, etc.), the consequent exudation is usually purulent, and does not respond so quickly to therapeutic measures. Deep-seated pain, increased by pressure on the tragus, is usually the first symptom experienced. The suffering may be intermittent, and mild during the day, but the pain increases at night. Children retire in their usual good health, but their slumber, without apparent cause, is disturbed; sharp crying and a tendency to rub the affected ear, with tossing of the head, are prominent symptoms in infants and young children. These objective signs, together with an examination of the membrana tympani, are all the diagnostic data obtainable in such young subjects. Deafness and pulsating tinnitus, more or less marked, depending upon the extent of the hyperæmia and swelling of the mucous covering of the middle-ear cavity and ossicles, together with a sense of fulness, are additional symptoms complained of by those old enough to make such observations. When a child persists in fretful crying, and the cause of its suffering cannot be otherwise explained, an examination of the *ears* will frequently reveal the true cause of its discomfort. On examination of the membrana tympani vascular injection will be noticed, especially marked along the handle of the malleus; bulging of the membrane may be present, but this is rare in simple catarrhal cases, unless (from neglect) the muco-serous exudate should accumulate in considerable quantity, in which state it will undergo decomposition unless relief is obtained from drainage through the Eustachian tube or by an opening in the membrana tympani. In mild cases the exudation is muco-serous and may give rise to very little suffering; but in the more severe forms it becomes distinctly purulent, associated with great pain, and regularly develops into the acute suppurative form.

TREATMENT.—We again desire to urge the importance of early and active treatment in primary disease of the tympanic cavity, in order to arrest the inflammatory process before it reaches the stage of suppuration. Bloodletting in front of the tragus by means of the artificial leech (see Fig. 42) is of the first importance in arresting the disease at the stage of hyperæmia and assisting in the relief of pain;

one or two cylinders of blood, or its equivalent (two to four Swedish leeches) should be extracted. In young children a blister in front of the tragus will answer a fairly good purpose when bloodletting cannot be resorted to. Hot sedative instillations, repeated as required to relieve pain, may be employed. Equal parts of tincture of opium and tincture of belladonna, warmed and dropped into the ear, or atropine sulph. gr. iij, morph. sulph. gr. xx, to aquæ f℥j, are valuable sedative solutions possessing marked anodyne effects. To avoid possible constitutional effects, proper judgment must be exercised in the use of the morphine and atropine solution. In severe cases applications of heat (dry or moist) will greatly assist in relieving pain; the heat is best applied by gentle antiseptic irrigation of the canal (through the fountain syringe), or the use of the hot-water bag. The applications must be *hot* to be effective. Irrigation is to be used only when dry heat fails to give relief, and even then the greatest care must be exercised not to use force. The naso-pharynx should be carefully examined and measures applied to correct any abnormal condition. Free purgation by the use of divided doses of calomel and sodium bicarbonate should receive early attention. Salol and phenacetin, or antipyrin in sufficient dose, will be of service in appropriate cases. Pilocarpine, by the mouth or hypodermically, may help to abort the disease if administered early.

Acute Suppurative Otitis Media.

As before suggested, this form of tympanic disease is an advanced stage of the non-suppurative variety, or, in other words, the inflammation, not having been arrested and confined to the muco-serous or catarrhal stage, passes on to the suppurative. The symptoms are similar to the foregoing but are greatly intensified, together with some involvement of the mastoid, which, however, usually subsides with the evacuation of the pus from the middle-ear cavity. The pain is at times most severe and increases in proportion to the distention of the membrana tympani by the progressive accumulation of fluid in the tympanum, until finally the pressure becomes so great that the tension of the drum is overtaxed, and, with a report quite audible to the patient, it ruptures. A copious flow of pus follows, and usually relieves the suffering. By this time, however, great damage has been done both to the membrana tympani and the tympanic cavity. Instead of the opening in the drumhead quickly repairing, as it will do when *incised*, the lacerated edges of the perforation are much slower to mend. The injury done to the delicate mucous lining of the tympanic cavity (due to maceration from pressure) gives rise to a discharge that becomes more or less chronic; whereas, if the accumulation had been promptly evacuated by means of a free incision, the pain would have

been relieved, cessation of the discharge accomplished, and a restoration of hearing produced, all within a few days.

The above is an outline of the average case of acute suppurative otitis media, the treatment of which must be varied, however, in accordance with individual cases, depending chiefly on the etiology. Cases occurring during the course of one of the eruptive fevers or some other severe constitutional disease, such as syphilis, tuberculosis, etc., do not of course respond to treatment so promptly, as improvement of the general health must first be accomplished. It is possible to have an acute otitis media progress to the stage of suppuration with rupture of the membrana tympani without any suffering whatever, the first symptom noticed being the discharge of pus through the external canal. This condition usually occurs in subjects of tuberculosis, which disease should be suspected even in those not previously known to be so affected. On the other hand, the membrana tympani may be so strong as to effectually resist the tension exerted by the progressive accumulation of fluid, and this will tend to find its way into the mastoid or to produce some intracranial complication. Fortunately, however, Nature has wisely provided a drum that will usually rupture of its own accord when the pressure from the accumulated pus reaches the danger-point.

A continuation of pain after the evacuation of fluid from the middle ear would indicate that thorough drainage had not been accomplished, which is accounted for by the opening in the drumhead being too high, or the paracentesis insufficient. Or again, the mastoid may have become involved, or an osteitis of the tympanic walls set up, all of which should receive prompt attention. As the pus or muco-pus accumulates in the tympanum, the drum-membrane undergoes marked changes, and in a corresponding degree the osseous meatus participates in the severe inflammatory process, both becoming extremely red and painful. The membrane loses all its characteristics, the handle of the malleus is no longer seen, and as the tension increases the short process becomes invisible, and finally the drum ruptures, unless other and better means are taken to evacuate the pus. If the opening in the drumhead is now examined, a pulsation, synchronous with the heart's action, will be seen. There will be more or less febrile disturbance present depending upon the severity of the attack.

TREATMENT.—It is to be assumed that if the patient is seen before actual suppuration has taken place, every effort will have been made to arrest or modify the disease without surgical interference. If, however, the case does not yield to the treatment outlined for catarrhal otitis media, and the pain continues, with bulging of the drumhead, the latter should be immediately incised, the point of election usually being the posterior inferior quadrant. However, as

it is possible for the pus to be confined either to the superior or inferior portions of the tympanic cavity, it is best to open the membrana tympani at the most dependent point; always remembering that in any case the object to be accomplished is the free evacuation of fluid from the middle-ear cavity. The drumhead, therefore, should never be punctured, but, on the contrary, a *free incision* should be made, always extending it down to the inferior surface of the canal, so as to ensure good drainage; otherwise the suffering and danger incident to confined pus will continue. Care should be taken that the incision shall not interfere with the ossicles. It seems scarcely necessary to suggest that surgical interference should only be attempted under good illumination and with perfect antiseptic precautions.

The after-treatment in most cases is very simple, and consists in carefully cleansing the ear every day with sterilized cotton twisted around an applicator, after which the canal is gently filled with a strip of iodoform-gauze. In uncomplicated cases the disease should be relieved in twelve days or less, while the hearing will be restored in about the same length of time. Should pain continue after liberation of the pus (mastoid involvement being excluded) it is probably due to the puncture being too small for the purpose of free drainage, or to a considerable maceration of the mucosa caused by the long-continued pressure of the confined pus. In the former case the opening should be enlarged without delay; in the latter, an application of silver nitrate, 5–40 grains to the ounce of water, should be warmed and applied directly within the middle-ear cavity once daily for several days, or until a healthy condition is produced. One application will frequently give prompt relief from further suffering. Hot antiseptic irrigation should not, as a rule, be used in acute suppurative cases; there are, however, some exceptions. Irrigation is especially serviceable in cases with continued severe pain and profuse discharge, particularly when resulting from one of the eruptive fevers, or from diphtheria. In these diseases, however, a much better and more prompt recovery is obtained by early incision of the membrana tympani. Nevertheless, it will be better to allow the drumhead to rupture (serious as this may be), and employ irrigation, rather than to have the possibility of a grave accident from the careless use of the knife, or an injury done to the canal by the introduction of the iodoform-gauze packing. Early inflation of the tympanic cavity was formerly thought to be an important part of the treatment, but this should not be done until improvement is well advanced, and then only for the purpose of preventing adhesions.

As incision of the drumhead is usually very painful, general anæsthesia should be employed when possible. Local anæsthesia has proved to be uniformly unsatisfactory, in our experience.

Chronic Suppurative Otitis Media.

Chronic suppuration of the middle ear is merely a continuance of the acute disease just described, caused either by a failure to relieve the acute form, or, as is more frequently the case, by the entire absence of any rational treatment. As before mentioned, tubercular suppuration may be primarily chronic and not pass through the acute stage of pain and other disturbance. Diphtheria, scarlet fever, and other exanthemata, on account of their specific nature and the great impairment to the general health they cause, are the chief factors producing chronic otorrhœa. There is always more or less impairment of hearing, depending upon the location of the perforation, the extent of thickening or swelling of the mucosa, and the amount of clogging of the chain of ossicles.

In uncomplicated cases the character of the discharge is that known as healthy or laudable pus. During repair it becomes thin or watery, progressively decreasing in quantity. When intermixed with blood, it indicates the presence of granulation-tissue. Decay of bone is shown by the pus being brownish in color, associated with excessive fœtor. It must be remembered, however, that non-fœtid pus contains large quantities of pathogenic cocci, in which state it is highly infectious, and as dangerous to life as the fœtid variety. In an ear that has been properly cleansed, excessive fœtor will arise only from bone-necrosis, and should elicit immediate efforts for its relief.

The brevity of this article will not allow a discussion of the location of the various perforations of the membrana tympani and their significance, except in so far as the necessity arises for dividing all cases of chronic otorrhœa into two classes, *i. e.* those in which the perforation is situated in the *inferior* part of the membrana tympani, and those involving the *superior* portion, more especially that part known as Shrapnell's membrane (membrana flaccida). This simple classification is advisable from the fact that the line of treatment differs materially in each. Furthermore, the former is indicative of a condition that is not prone to serious complications and usually yields promptly to treatment of the more ordinary kind, whereas the latter variety is always significant of a much more serious disease. Granulation-tissue (always the product of chronic suppuration), and necrosis of the ossicles or walls of the tympanum and mastoid antrum, must invariably be suspected. It will be seen, therefore, that this latter form of chronic otorrhœa is capable of causing a condition so formidable as to at once become a daily menace to life, and which cannot, as a rule, be permanently relieved except through operative interference. When one remembers the very thin plate of bone that separates the middle ear from the interior of the skull and important blood-vessels, and the direct communication with the mastoid antrum and cells, it

does seem remarkable that many more fatal complications do not occur. The longer the suppuration continues the greater will be the destruction of these delicate walls; and hence the danger to life will be correspondingly increased.

TREATMENT.—We will first consider the treatment of cases in which the perforation is situated in the inferior half of the drumhead, and then take up treatment of cases with the opening in the superior portion. Sometimes the entire membrana tympani is destroyed, the treatment of which condition will come under the second heading. The chief object, in any and all classes of cases, is the use of every available means to relieve or modify a discharging ear, thereby preventing any serious or fatal complications; remembering that the longer the case continues the more imminent the danger becomes. It must not be forgotten, however, that the same formidable implications may occur in the acute disease, but with less frequency. Cleanliness and general antiseptic precautions are so absolutely essential in the successful treatment of all cases, that any deviation from their well-defined principles will generally result in failure. Irrigation with an antiseptic fluid should only be employed in exceptional cases. A better and more thorough way to cleanse the ear is to mop it out with sterilized cotton saturated with hydrogen peroxide until all secretion has been removed, when applications of stimulating or slightly escharotic solutions should be made into the tympanic cavity, as the case may require, depending upon the presence or absence of a tendency to granulations. This should be followed by packing the deep canal with iodoform-gauze, renewed every one, two, or three days, according to the amount of discharge. Repeated cleansing of the ear in this manner (cotton twisted on applicator) with a warm 2 per cent. solution of carbolic acid, hydrogen dioxide, or liq. plumbi subacetatis, followed by the iodoform-gauze packing, will be sufficient to cure most cases of recent date. Those of longer standing may, in addition, require the stimulation of nitrate of silver in various strengths, commencing with 5 grains to the ounce and increasing to 60 grains if necessary. Dusting the surface with acetanilid powder will assist in arresting putrefactive changes, when such an agent is required. An attempt to destroy granulation-tissue can be made with strong solutions of chromic acid or nitrate of silver, or, still better, the application of absolute alcohol. Pain caused by the alcohol will be somewhat reduced by combining with it a 50 per cent. solution of boro-glyceride in the proportion of 1 drachm to the ounce of alcohol. Whatever the line of local treatment, it should be followed by the iodoform-gauze packing. The so-called "dry treatment" by packing the ear full of boric acid or other powder must be condemned on account of its interference with drainage.

Clinical experience alone will enable the practitioner to decide as to which of the foregoing methods should be used in any individual case. If, however, the disease after a reasonable amount of treatment has not been cured, or gives no evidence of ultimate relief, the opening in the membrana tympani should be enlarged (if necessary), and the granulations or other pathologic products gently curetted from the tympanic cavity, followed by the simple treatment above related. This operative procedure should not in the least interfere with the ossicles. After an extended experience it has proven most satisfactory, many cases promptly recovering without subsequent discharge, and the hearing becoming quite normal. This as well as other operative measures should only be attempted by those familiar with such work. As a rule, no effort should be made to hasten repair of the perforation in the drumhead; as suppuration subsides, the gauze packing should be gradually withdrawn from the vicinity of the membrana tympani, which ordinarily heals without further attention. The naso-pharynx must receive due consideration in all cases; as also should the general health, in order to correct any physical disturbance, by the administration of therapeutic measures suitable for individual cases, including proper diet, tonics, etc.

As before mentioned, perforations situated high up in the tympanic membrane indicate a much more formidable disease than those confined to the inferior portion. Extensive granulations, with more or less necrosis of the ossicles and tympanic walls, are usually present, and in turn predispose (by direct continuity of structure) to brain or mastoid abscess; or the infectious matter may be communicated to the dura mater, causing subcranial abscess or diffuse meningitis, or to the blood-vessels in the diploë, giving rise to osteo-phlebitis, thrombosis of the lateral sinus, or pyæmia. The only effective line of treatment in such cases is an operative one, although it is well (unless urgent symptoms arise) to first institute the foregoing line of treatment. If, however, granulation-tissue and decay of bone are present, it is certainly unwise, and even dangerous, to be content with any treatment short of removing the necrotic malleus and incus, and other pathologic products from the tympanic cavity. By this procedure we establish a free drainage, and make an opening into the tympanum sufficiently large to admit of the site of the disease being properly treated; furthermore, if this rational interference be established before brain or mastoid complications have set in, these developments will almost surely have been prevented; besides, the discharge in most cases will cease, and the hearing in the majority of patients greatly improve.

The limits of this article will not permit a consideration of the technique of these delicate operations. Those desirous of further

information on this subject, and a discussion of the many complications and sequelæ arising from suppurative diseases of the ear, are referred to the comprehensive works of Burnett, Sexton, and Dench, or the forthcoming work of Laurence Turnbull.

Chronic Non-suppurative Otitis Media.

Chronic aural catarrh is pre-eminently a disease dependent for its existence upon some catarrhal condition of the nose or throat. The mode of implication is by continuity through the Eustachian tube, both ears usually being affected, although not always to the same extent. The three principal forms of chronic catarrh seen in the naso-pharynx are dry, granular, and relaxed. The dry form is prevalent in hot, dry climates; the surface of the pharynx being so entirely devoid of moisture as to present a glazed appearance. Granular catarrh is, however, quite the reverse, the pharyngeal mucous membrane being somewhat thickened, and projected above this surface are numerous red granulations about the size of a millet-seed. The Eustachian tubes are more or less obstructed, but it is unusual to find complete obliteration of their lumen. This partial occlusion is, however, inadequate to admit the entrance of air into the tympanic cavity in sufficient volume to equalize the atmospheric pressure exerted on the drumhead through the external canal; the result being that the membrana tympani is at times so markedly retracted that it becomes adherent to the promontory of the middle ear. As the long handle of the malleus extends between the layers of the membrana tympani (to which it is firmly attached), it is evident that this excessive retraction must somewhat misplace and suspend the function of both the drumhead and ossicles, thus causing more or less severe tinnitus and vertigo, as the direct result of undue impaction of the stapes into the fenestra ovalis. Unless relief is obtained (a difficult matter in cases of long standing), this condition continues over a greater or less period of time, until finally the labyrinth or auditory nerve becomes seriously implicated, followed by the inevitable result, *deafness*, more or less complete, and generally of a permanent character.

Probably this disease, more than all others, predominates as the most frequent cause of deafness. This can be accounted for from the fact that, until it has become fairly well established, it is virtually an affection without symptoms or discomfort noticeable to the average patient. As the disease is without pain, the first symptom observed by the patient is a slow but surely progressive impairment of hearing, accompanied by a similar gradually increasing tinnitus. The deafness varies considerably from day to day, being worse in damp and cold weather. As time progresses the deafness becomes very marked;

later the patient discovers that he "hears better in a noise" (*paracusis Willisii*), as, for example, when riding on a railway train. This phenomenon indicates that the disease is well advanced, and not very hopeful as regards beneficial treatment. The absence of wax, and an unusually clean polished surface of the external canal and membrana tympani, are objective symptoms characteristic of this disease. The drumhead, however, frequently loses its lustre, and may show considerable opacity, or crescentic areas of calcareous deposits. The absence of bone-conduction renders a case quite hopeless as regards improvement in hearing power, although much can be accomplished for the relief of distressing tinnitus and vertigo.

Treatment.—The objects to be accomplished are the alleviation or cure of the naso-pharyngeal catarrh; the free admission of atmospheric air into the tympanum, and the restoration (as far as possible) of the membrana tympani and ossicles to their normal position.

Manifestly, the degree of success we may attain in one or all of these objects will depend upon the stage at which individual cases are seen. In recent cases the correction of an abnormal condition of the naso-pharynx and gentle inflation of the middle ear by Politzer's method will suffice to restore the hearing. Obstructive growths in the nostrils and post-nasal space must be removed, and every effort made to restore them to a normal condition, which will have a similar effect upon the Eustachian tubes. An alkaline wash for the nostrils and astringent gargles for the throat should be used by the patient at home. Free *nasal* respiration must be established to make other treatment effective. The application of nitrate of silver solutions in varying strengths can be made to the pharynx, as can also—

℞. Tinct. iodi,
Tinct. guaiaci, āā. ʒj (4.);
Tinct. benzoin. comp., fʒj (30.).—M.

Or the following can be applied to the nostrils, the naso-pharynx, and throat:

℞. Iodi, gr. v (0.31);
Creasoti (beechwood), ♏v (0.31);
Potassii iodi, ʒj (4.);
Glycerini, fʒj (30.).—M.

These solutions should be applied two or three times each week, the efficiency of treatment often depending upon the variety of applications used. Injections of various fluids and vapors through the Eustachian tube into the tympanic cavity (their utility being problematical) should only be attempted by those familiar with such work.

If an apparent obstruction in the Eustachian tube does not yield to the proper use of Politzer's method of inflation it is not likely to be improved by the use of the Eustachian catheter, unless in expert hands. On the contrary, its unskilful use is capable of doing serious damage. In cases where the tube is patulous and no adhesions present, the membrana tympani can usually be restored to its position by the use of Politzer's bag, but firm bands of adhesions must be divided before we can secure liberation of the membrane and ossicles. Massage with Siegle's pneumatic speculum, or equivalent apparatus, is of some service in many cases. Hypodermic injections of pilocarpine in sufficient dose to produce profuse diaphoresis can be used with benefit when the internal ear is implicated, especially if a syphilitic tendency is manifest.

Excision of any part of the sound-conducting apparatus should only be employed when relief from severe tinnitus or vertigo is the object of such treatment. It is possible, however, in well-selected cases, to give considerable improvement in hearing, and relief of tinnitus and vertigo, by severing the adhesions between the promontory and membrana tympani, and thus re-establishing the function of the chain of ossicles and the drumhead.

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